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SIXTEENTH ANNUAL REPORT

OF THE

Mass:
= COMMISSIONERS

ON

INLAND FISHERIES,

and game

FOR THE

YEAR ENDING SEPTEMBER 30, 1881.

BOSTON:

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Commonwealth of Massachusetts.

To his Excellency the Governor and the Honorable Council.

THE Commissioners on Inland Fisheries beg leave to present their Sixteenth Annual Report.

FISHWAYS.

Surveys and plans of fishways over the dams on Ipswich River were made and forwarded to the owners, Aug. 15, 1881, as follows : Ipswich Mills, Ipswich ; Willowdale Manufacturing Company, C. J. Norwood, Ipswich ; and Ripley Brothers, West Danvers.

Petitions received, and Dams examined.

From the selectmen and others of Swansea was sent a petition for a fishway over the dam owned by John S. Brayton. As there had been no migratory fish above this dam for many years, the Commissioners declined to order a fishway, unless the town would agree to re-stock the stream. This the selectmen would not do ; and further action was postponed until their next town-meeting. From the selectmen of Acushnet a petition was received for fishways over dams owned by Hervey Wilber and others, and by Samuel B. Hamlin, and for one at the New-Bedford water-works. An examination of the premises showed that a fishway at the water-works would probably not be required, unless the water was kept much higher than by the present arrangement. The two lower dams required fishways. This stream is an unusually good one for alewives ; but, like the one in Swansea, it should first be re-stocked by the town.

The fishway at East Dennis passes under the highway (county road). By an Act of the Legislature passed 1881

(chap. 301), the Sesuet Cranberry Company was obliged to construct "such a fishway as the Commissioners on Inland Fisheries may direct." It was examined and accepted.

Two dams on the stream leading from Eel Pond in Melrose have been surveyed. This pond has been stocked with alewives by several citizens of Malden and Melrose; but, since they commenced this work, Mr. Cockrell has established print-works on the stream, which so pollute the water as to render it doubtful whether the fish can pass them alive. The construction of fishways was delayed until further investigation.

Fishway at South-Hadley Falls, on the Connecticut River.

In order to protect what little interest Connecticut has left us in this river, several persons have been employed at different times to look after the Holyoke fishway. Sundry complaints have been received, anonymous for the most part, stating that the superintendent was taking fish from the fishway, and selling them. As the persons employed had furnished satisfactory evidence of their honesty, no notice was taken of these anonymous letters. Subsequently, a communication duly signed was sent to the Governor, making similar charges. This was forwarded to the Commissioners; and through the kindness of Mr. Wade, chief of the detective force, the matter was put in the hands of an officer, who failed to get any information. This year, several applications were made for the position of superintendent, and were so strongly pressed as to lead to the suspicion that something more than the small compensation offered by the State influenced the applicants.

While these applications were under consideration, Mr. William H. Foote of Westfield, who has taken great interest in fish-culture, wrote to the Commissioners that about fifteen hundred lamper eels, taken the previous night from the Holyoke fishway, had passed through Westfield on their way to Connecticut. These depredations he thought he could stop, if he had the appointment of deputy-commissioner. The appointment was sent; and Mr. Wade telegraphed to Mr. Kellogg of Pittsfield to report at once to Mr. Foote. The results of his service, for which he made no charge, will be found in his report in Appendix C.

The Commissioners are under obligations to Mr. Wade for his earnest co-operation in their efforts to enforce the laws; and, among the detectives detailed for the work, they heartily commend Mr. Kellogg of Pittsfield for his prompt and energetic assistance to Mr. Foote. One of the persons arrested at Holyoke, and convicted, had been employed as superintendent of the fishway.

The fishway at Lawrence, under the care of Thomas S. Holmes, was closed for about twenty minutes twice a day during the run of fish, to ascertain what fish were passing over it. In no other way could the desired information be obtained; for, with the full flow of water winding through the many turns, it is impossible to see even the largest salmon.

REPORT OF THOMAS S. HOLMES, ON FISH SEEN IN THE LAWRENCE FISHWAY FROM APRIL 22 TO NOV. 1, 1881.

- April 22. Let water into the fishway; during the rest of April the river was very high, and water very turbid; no fish to be seen.
- May 3. Saw the first fish of the season, one sucker.
 7. Suckers and alewives, run small.
 8. No fish to be seen.
 9. Suckers and alewives, run small; one lamper eel.
 10. Suckers, alewives, and lamper eels, run small.
 11. Suckers, alewives, and lamper eels, run small.
 12-15. River high and muddy; no fish to be seen.
 16. Suckers and alewives, run small.
 17-23. A freshet in the river; no fish in fishway.
 24. Suckers and alewives, run small.
 25. Suckers and alewives, run small; lamper eels, run moderate.
 26. Suckers and alewives, run moderate; lamper eels, run small.
 27. Alewives and suckers, run moderate; lamper eels, run small.
 28. Suckers, alewives, and lamper eels, run small; one black bass.
 29. Suckers, alewives, and lamper eels, run small; one black bass.
 30. Suckers, alewives, lamper eels, and chubs, run small; *one large shad*.
 31. Suckers, alewives, and chubs, run moderate; lamper eels, run small.
- June 1. Suckers, chubs, and lamper eels, run moderate; alewives, run small.
 2. Suckers, chubs, and lamper eels, run moderate; alewives, run small.
 3. Suckers, chubs, and lamper eels, run small; one black bass.
 4. Suckers, chubs, and lamper eels, run small.
 5. Suckers, chubs, and lamper eels, run small; one black bass.
 6. Suckers, chubs, and lamper eels, run small.

- June 7. Suckers, chubs, and lamper eels, run small; one black bass, *one salmon*, 20 pounds.
8. Suckers, chubs, and lamper eels, run small.
9. Suckers and chubs, run small.
10. Suckers and chubs, run small.
11. Suckers, chubs, and lamper eels, run small.
12. River has risen considerably; no fish.
13. Suckers and lamper eels, run small.
14. *One salmon*, 15 pounds.
15. Lamper eels, run small; *three salmon*, 15, 20, and 30 pounds.
16. Suckers, chubs, and lamper eels, run small.
17. Suckers, chubs, and lamper eels, run large.
18. Suckers, chubs, and lamper eels, run moderate.
19. Suckers, chubs, and lamper eels, run moderate.
20. Suckers, chubs, and lamper eels, run moderate; alewives, run small.
21. Suckers, chubs, alewives, and lamper eels, run small; *one shad*, *five salmon*, 12 to 18 pounds.
22. *Four salmon*, 10 to 20 pounds.
23. *One shad*, *four salmon*, 10 to 20 pounds.
24. Suckers and lamper eels, run large; small silver eels, run small.
25. Suckers and lamper eels, run large; *two salmon*, 10 to 20 pounds.
26. Suckers, lamper eels, and small silver eels, run moderate.
27. Lamper eels, run large; suckers, chubs, and silver eels, run small; *two salmon*, 16 to 20 pounds.
28. Suckers, chubs, lamper eels, and small silver eels, run small.
29. *Eleven salmon*, 10 to 20 pounds.
30. *Nineteen salmon*, 8 to 20 pounds.
- July 1. Suckers, chubs, lamper eels, and small silver eels, run small.
2. Suckers and chubs, run small; one black bass, *one salmon*.
3. Suckers and chubs, run small; *one shad*, *two salmon*.
4. Suckers, chubs, and small silver eels, run small.
5. Suckers, chubs, and small silver eels, run small; *three salmon*.
6. Suckers, chubs, and small silver eels, run large; one roach, six black bass, *one salmon*.
7. Suckers, chubs, and small silver eels, run large; three black bass.
8. Suckers, chubs, and small silver eels, run large; one black bass.
- 9-14. Nothing but suckers, chubs, and small silver eels, run moderate.
15. Small silver eels, run moderate; river low; no water running over the dam.
16. Small silver eels, run moderate.
17. Suckers and chubs, run small; small silver eels, run moderate.
18. Shut water out of fishway at 7 A.M.; a few suckers and small silver eels in it.
19. Let water into fishway at night.

- July 20. Shut water out at 7 A.M.; a few small silver eels in it.
23. Let water into fishway in the afternoon.
24. Suckers and chubs, run small; small silver eels, run moderate;
two black bass.
25. Suckers, chubs, and small silver eels, run small.
26-29. Suckers and chubs, run small; small silver eels, run large.
30. Small silver eels, run moderate; *one salmon*, 10 pounds.
31. Suckers, chubs, and small silver eels, run moderate; one black
bass.
- Aug. 1-5. Suckers and chubs, run small; small silver eels, run large.
6. Suckers and chubs, run small; small silver eels, run moderate;
two black bass.
7. Suckers and chubs, run small; small silver eels, run moderate;
one black bass.
8-10. Suckers and chubs, run small; small silver eels, run moderate.
11. Suckers and chubs, run small; small silver eels, run moderate;
three black bass.
12. Suckers and chubs, run small; small silver eels, run moderate.
13. Suckers and chubs, run small; small silver eels, run moder-
ate; six black bass.
14. Suckers and chubs, run small; small silver eels, run moderate;
ten black bass.
15-18. Suckers, chubs, and small silver eels, run small; water shut
out 18th, 9 A.M.
20. Let water into fishway at 7 P.M.
21. Suckers, chubs, and small silver eels, run small; thirteen
black bass.
22. Suckers, chubs, and small silver eels, run small; two black
bass.
23. Suckers, chubs, and small silver eels, run small.
24. Suckers, chubs, and small silver eels, run small; shut water
out this morning.
27. Let water in in the afternoon.
28. Suckers, chubs, and small silver eels, run small; three black
bass.
29. Suckers, chubs, and small silver eels, run small; two black
bass.
30. Suckers, chubs, and small silver eels, run small; one black
bass.
31. Suckers, chubs, and small silver eels, run small; shut water
out this morning; river low.
- Sept. 3. Let water into fishway in the afternoon.
4. Suckers, chubs, and small silver eels, run small; two black
bass.
5. Suckers, chubs, and small silver eels, run small; two black
bass.
6. Suckers, chubs, and small silver eels, run small.
7. Suckers, chubs, and small silver eels, run small; one black
bass.

Sept. 8. Suckers, chubs, and small silver eels, run small; two black bass.

9-14. Suckers, chubs, and small silver eels, run small.

15. Suckers, chubs, and small silver eels, run small; two black bass.

During the rest of the month nothing but a few suckers, chubs, and small silver eels; water shut out part of the time. During October the water was shut out of the fishway more than half of the time, the river being low. When water was in, there were a few suckers, chubs, and silver eels in it up to the 15th, when the eels stopped running. After that, saw now and then a sucker and chub up to the 1st of November.

The number of salmon seen in the daily inspections was 72, by much the largest number yet recorded: that for 1877 was 47; for 1878, 17; for 1879, 29; and 1880, 28. What is curious is, that they nearly all run up in one school at the end of June, when 30 out of the 72 were seen in two days. There was no autumn run at all. Four shad were observed in the way, a fact that once more proves the adaptation of the structure to this species of fish. The number of black bass seen was about three times that of any preceding year. It would not be surprising were the black bass to increase considerably, since the river is full of food suitable for them. The run of other fish, such as alewives and lamper eels, was about an average one.

LEASED PONDS.

Up to the present time but few of the annual returns required from the lessees of ponds have been received, and therefore no accurate statement can be made of the catch of the past season. In some instances, where ponds have been leased to towns, there appears to be a disappointment in the results. The complaint in most cases is, not of scarcity of fish, but that the black bass, so generally introduced into the leased ponds, cannot be caught. They appear to be plenty, but will not take bait. This difficulty may be accounted for, partly by the abundance of food, and partly by the fact that the habits of this fish are not commonly understood.

The charge made in some of the returns, that the bass have destroyed the pickerel, is hardly probable, though the old adage, "The big fish eat the little fish," holds true in this as

in other instances. That the large bass eat the small pickerel, and *vice versa*, there is no doubt; but, unless the bass become very numerous, there is little danger of their greatly damaging the pickerel.

If it be true that the bass clear out the pickerel, they ought to be introduced into all ponds containing this voracious fish.

There is no more destructive fish in our ponds than the red perch, and it is well known that the bass feed freely upon them. In fact, when fishing in deep water, there is no better bait for him than perch.

It may assist some of the fishermen to know that it is of little use to fish for bass in the summer after ten in the morning, or before four in the afternoon, and not then, unless there is a ripple upon the water. Bass, like many other fish, have their haunts, or places where they may be found at certain seasons; and one of the first things for the fisherman, if he would be successful, is to know where they are. Many of the lessees have been recommended to put white perch with the bass into the ponds; and, where this has been done, it has given general satisfaction.

In the Appendix will be found several returns giving a fair idea of what have been received, so far, this year. It will be noticed that the returns from Stockbridge and Pittsfield are in proper form, and are model reports, which some of the lessees of ponds will do well to imitate; for, notwithstanding they have been repeatedly notified of what is required of them, many deal only in general statements. Of these, the return from Framingham is an example.

The average returns received during the last three years show a constant increase of these fisheries, and fully sustain the policy of the State in placing these hitherto waste waters under cultivation and intelligent control.

TROUT.

“As the cultivation and rearing of trout more strictly comes within the scope of private enterprise, it has been thought best not to devote any more time or expense in that direction than was necessary to furnish the desired information in regard to it. At the time the lease was obtained of the grounds and ponds for the works at Plymouth, N.H., we were obliged to take with them some three hundred trout, with the provision that the same number should be returned at the expiration of the lease. These, with what have since been taken when fishing for salmon, furnish

quite a number of breeding-fish, from which we have taken this year something over one hundred thousand spawn, one-half of which belongs to Massachusetts. The State has been to no additional expense in procuring these eggs; and it may be desirable to furnish a part of the young fish to persons having control of streams, on condition that they will keep a record, and furnish statistics in regard to them.

“There are other waters still open to the public, to which private parties would be willing to bear the expense of transportation for the sake of having streams re-stocked.”

The trout hatched this year were distributed to the following applicants:—

DISTRIBUTION OF TROUT-FRY.

	CANS.
Dr. Samuel Camp, Great Barrington	4
William F. Freeman, Pepperell	1
Portia W. Aldrich, Boston	1
A. J. Forbes, Boston	1
John Alden, Stoneham	1
F. W. Homans, Gloucester	1
George L. Damon, Boston	1
E. W. Sewall, Medfield	1
George H. Weld, Rochester	1
Thomas H. Lawrence, Falmouth	1
W. Hapgood, Boston	2
John Dyer, Roxbury	1
Thomas Talbot, North Billerica	2
Head-waters Mystic River	3
S. W. Lincoln, Adams	1
Samuel Healey, East Weymouth	1

There will be about sixty thousand young trout ready for applicants the latter part of March or first of April next, delivered at the hatching-house at Winchester free of charge.

LAND-LOCKED SALMON.

The amount of spawn received from Grand Lake Stream was,—

Jan. 24, 1881	70,000
March 7, 1881	130,000
March 21, 1881	110,000
Total	310,000

The spawn arrived in good condition, and was hatched with a loss of less than seven per cent; but the bulk of it came so late that it was the middle of June before the young

fry were large enough to distribute, and then they were not as strong as those hatched earlier. This, with the warm weather, caused, in several cases, considerable loss in transportation, and consequently some irregularity in distribution, as well as some variation in the number of fish in the cans. It was estimated that on an average each can contained thirty-six hundred young salmon.

These fish, to be successfully introduced, should be put in in large numbers, to enable them to hold their own against other occupants of the pond. That they have been planted in too small numbers, and put into some ponds that are not suitable for them, there is no doubt. This could not well be avoided, as the demand was greater than the supply; and the applicants claimed, that, if their waters were not the best, they were entitled to receive their proportion, and to make a trial. Some of them now report that nothing has been seen or heard of the salmon since they were turned in. It is too soon to assert that they are a failure, even in these doubtful waters; and the fact that they have not been seen does not prove that they have not survived.

It takes three years for alewives and shad, and four years for salmon, to mature. In fish-culture the work of to-day is only crowned in the years to come.

Of the returns from fifteen ponds, received this fall, eight claim that salmon have either been caught or seen in considerable numbers. The stocking of Half-way Pond, in Plymouth, under the care of the Commissioners, was perfectly successful; and had not fishermen infested the outlet, and destroyed many of them before they had time to grow large enough to deposit their spawn, they would, in a few years, have been very abundant. The following distribution was made of land-locked salmon for 1881:—

	CANS.
Joseph D. Gowing, North Reading	1
A. L. Hubbell, Great Barrington	6
D. J. Wetherbee, Acton	2
J. P. Hewins, Sharon	2
George H. Weld, Rochester	2
Valentine B. Newcomb, West Brewster	2
Thomas H. Lawrence, Falmouth	3
William A. Smith, East Milton	1
H. Newcomb, Greenwood	2
George Jewett, Fitchburg	5

	CANS.
Will Perham, Tyngsborough	1
B. P. Chadwick, Bradford	2
H. E. Priest, Waltham	2
W. A. Bullard, Cambridgeport	2
H. H. Wyman, Winchendon	2
W. E. Gavit, Stockbridge	7
Henry Hobbs, Wenham	4
Reuben Noble, Westfield	6
Ivers Adams, Ashburnham	3
P. P. Akin, South Yarmouth	1
Abishai Phinney, Falmouth	4
George G. Lowell, Cotuit Port	2
Head-waters Mystic River	7
Half-way Pond, Plymouth	11

All parties ordering land-locked salmon must make application in writing, giving a careful description of the pond in which they desire to place them. The plan is to furnish them at the State hatching-house in Winchester, free of charge, to all applicants having under their control any of the great ponds of the State. Persons who transport them must have a thermometer, and a dipper for aërating the water. The introduction of salmon into ponds having no inlet or outlet will, for the present, be discontinued. As these fish are distributed under the care of one of the Commissioners, at a time when his services are needed elsewhere, applicants are requested to come without delay when notified. No orders will be received after April 20.

THE MERRIMACK RIVER.

By an Act of the Legislature passed May, 1867, all fishing with seines was prohibited in the Merrimack for a period of four years. No objection was made to this Act by the fishermen, for the simple reason that the salmon formerly frequenting the river had all been destroyed, and the shad so reduced in number that more than two-thirds of the seining-grounds had been abandoned as worthless. This condition of the fisheries was caused mainly by the erection of the Lawrence dam, which cut the salmon off from all their spawning-grounds, and so reduced the spawning-grounds of the shad, that it became a question of only a few years when the Merrimack shad would cease to be of any interest.

The remedy for this depletion lay in extending their breeding-grounds above the dam, or in artificial hatching, or, what would perhaps be better, in both combined. To some extent, both remedies were applied, but not with that intelligence which marks the present condition of fish-culture. In 1869, hatching of shad, in a small way, was commenced at North Andover, and continued till 1876, with decided results. Whatever advantages have accrued to those who have been engaged in the shad fisheries on the Merrimack, since 1874, is largely due to artificial hatching. In consequence of the opposition of the fishermen, and the difficulty of making satisfactory arrangements at North Andover, the only breeding-ground of shad in this river, it was decided to suspend this work for a time. In the report for 1876 it was stated that it was thought best to abandon, for a while, artificial hatching of shad, and that it required no great foresight to predict a considerable falling-off of the shad fisheries of this river during the next three or four years.

While the results of artificial hatching were encouraging, it fell short of what was anticipated, and of what there was a right to expect from experiments made elsewhere. The predictions in regard to the decrease of the shad have been fully verified, the catch the past season having been much less than any year since the river was re-opened: so great was the falling-off, that it was deemed necessary to look to some other cause than lawful fishing in the river. This, with the destruction of salmon by poachers last year below Lawrence, led to the detailing of detectives to see that the laws were observed. They were also instructed to investigate all matters pertaining to the fisheries of the Merrimack. The work was faithfully done, and the investigation thorough, leaving no doubt that the present condition of the fisheries is due largely to acts of fishermen at Newburyport. Under the pretence of fishing for menhaden, these men have yearly destroyed hundreds of thousands of young migratory fish that play back and forth in the brackish water of the lower river, and have sold them at an insignificant price to fishermen for bait.

Four years ago some of these men were arrested for illegal fishing; and the case was dismissed on the ground that the mouth of the river had never been defined, as provided for in chapter 384 of the Acts of 1869. While an application made

to the Governor for a definition of the river's mouth was under consideration, the Newburyport fishermen came forward, and entered into an agreement, a record of which is here copied from the report of 1877:—

“Fishing with seines in the Merrimack at the season when the menhaden stand in is forbidden by law. The *mouth* of the river has, however, never been defined by the Governor as permitted by statute, and it was represented to the Commissioners that valuable menhaden fisheries existed in this neutral ground of brackish water. Therefore, under the personal promise of the fishermen to capture no shad or salmon, and with the guaranty of responsible persons in Newburyport, the Commissioners agreed to defer the definition of the river-mouth, and to assume that these menhaden were not positively included in the river proper.”

This agreement shows the disposition of the Commissioners to give to the fishermen the largest liberty consistent with the interests of fish-culture. During the last season the agreement was renewed, both verbally and in writing, and signed by the leading fishermen on that part of the river.

How well it was kept will be readily understood when it is stated, that no less than eleven large seines, of small mesh, manned by thirty or forty men, have constantly swept the river from the chain bridge above Newburyport to Plum-Island Lighthouse, during the months of May, June, and July; and that the pay for boats, seines, and men has been derived entirely from the catch of salmon, shad (both large and small), and a few alewives, called bluebacks. Not a single menhaden has been seen in the river this year.

The following statements, made and sworn to by the fishermen of Newburyport in their annual returns, show the catch of menhaden during the last five years:—

Catch of Menhaden at Newburyport.

1877	2,013,675
1878	473,088
1879	24,075
1880	9,500
1881	None.

To make up for the loss of menhaden, the fishermen are ruining the river by the wholesale destruction of migratory fish. In view of these facts, the supposed partial failure of artificial hatching at North Andover, the non-appearance of

shad in any considerable numbers at the Lawrence dam from the planting in the waters above, and the rapid decline of the shad fisheries below, are no longer a matter of mystery.

On the petition of the mayors of Lawrence and Haverhill, and of most of the fishermen above chain bridge, the Commissioners requested his Excellency the Governor to define the mouth of the river; and the following order was accordingly issued:—

COMMONWEALTH OF MASSACHUSETTS.

COUNCIL CHAMBER, BOSTON, NOV. 9, 1881.

Ordered, Upon recommendation of the Commissioners on Inland Fisheries, in accordance with section 17 of chapter 384 of the Acts of the year 1869, that the mouth of the Merrimack River be fixed and defined at a line drawn between the North and South Breakers, so called; so that all water lying west of said line, and included between the jetties now constructing, shall be within the mouth of said river.

Adopted.

HENRY B. PEIRCE,

Secretary.

By hatching shad at North Andover, and carrying the young fish well up the river, the breeding-grounds might be extended, giving a large increase in addition to the artificial propagation. The statement in regard to the increase of the breeding-grounds is based upon the fact, that, of the few shad known to have reached the Lawrence dam since the new fishway was constructed, many, and perhaps all, have gone freely over it. That there is no impediment to the easy passage of all kinds of fish over this dam is well known to all who have paid the subject any attention.

SALMON.

Massachusetts' share of spawn from the Bucksport establishment was 220,000. Of this number, 50,000 were received at the State hatching-house, Winchester, from which about 47,000 young fish were hatched, and deposited in the head-waters of the Nashua River. The balance, 170,000, were forwarded to Plymouth, N.H. This, with the portion due that State, together with spawn taken at the Plymouth works, swelled the amount to 419,500 eggs, from which 411,000 fish were obtained, and deposited in the head-waters of the Merri-

mack. Notwithstanding the depredations committed on the river last year, and the autumn drought of this year, the run of salmon has been much larger than in any previous season since the river was re-opened.

Mr. A. H. Powers, Commissioner for New Hampshire, and superintendent of the works at Plymouth, under the joint action of the two States, makes the following report:—

PLYMOUTH, N.H., Nov. 15, 1881.

To E. A. BRACKETT, *Commissioner on Inland Fisheries for the Commonwealth of Massachusetts.*

The sixty thousand eggs mentioned in my last report, obtained from the salmon taken at the hatching-house on the Pemigewasset River, were hatched with a loss of eight per cent.

In December, 1880, and January, 1881, I received 419,500 Atlantic salmon-eggs from Bucksport, Me. These were hatched with a loss of 7,533. During the month of May, 30,000 young salmon were put into the Contoocook River at Hillsborough. The remainder of both lots, something over 420,000, were put into the Pemigewasset River, from one to three miles above Livermore Falls.

This year twenty-five salmon have been caught at the hatchery, varying in weight from eight to twenty-two pounds. The nets were set June 2: the first salmon was caught June 20; the last, Sept. 26. Twelve were females, and from them we have secured a hundred and twenty-five thousand eggs, as follows:—

Oct. 18, from 2 fish	.	.	.	.	.	.	.	.	24,000
Oct. 25, from 6 fish	.	.	.	.	.	.	.	.	53,000
Oct. 30, from 4 fish	.	.	.	.	.	.	.	.	48,000
									<hr/> 125,000

The past summer, like that of 1880, has been a very dry season, and the river has been low the greater part of the time, which, in part, accounts for my not taking more salmon, as I have no doubt that large numbers came up the Merrimack this season.

Last winter, when the trout-pond was frozen over, the mink tunnelled under the snow and ice, and caught over half the breeding-trout before I knew it; but we soon put a stop to that business by catching three of the thieves, and have built two plank tanks twenty-five by six feet, that I think will keep out all of that kind of poachers.

This season we have taken, to date, a hundred and ten thousand trout-eggs; the first spawn taken Sept. 23.

I have bought and caught something over four hundred trout; so that next year we shall have a good number of breeders.

Yours truly,

A. H. POWERS.

During the low stages of water, the salmon have been more or less stopped at Manchester, N.H. After the urgent ap-

peal in 1864, from New Hampshire, charging Massachusetts with depriving her of migratory fish by impassable dams at Lawrence and Lowell, it was hardly to be expected that any obstacle would be allowed in that State to retard the work now being so successfully carried out. The difficulty is not in the fishway proper, which was intentionally designed to save to the mill-owners all the water possible. So long as the water is confined to the walls of the fishway, it is ample for the passage of all kinds of fish; but at the foot of the pass there is a heavy fall, over ledge and bowlders, where the water is so scattered, that, without an additional supply, the fish cannot reach the dam. This is, to some extent, the case at Lawrence and Lowell. At Lowell something has been done to obviate the difficulty by blasting out a channel, which takes a large portion of the waste water. A still further improvement at this place is desirable. The action of the Essex Company has been quite satisfactory. One of its employees has had charge of the fishway, receiving a small sum from the State for extra services in examining it during the run of fish, and for making a detailed report of what is found in it. There has been no complaint of any impediment to the passage of fish at this dam.

It appears that the owners at Manchester have been constructing new mills, and disposing of additional water-power, which accounts for the water being below the crest of the dam at a time when most needed for the passage of salmon.

There is an impression among some of the mill-owners, that, when they have built their fishway in accordance with the plans furnished them, their duties cease. This is an error. They are legally bound *to remove all obstacles* to the passage of fish, which may have been created by the erection of these dams; for it has been decided by the Supreme Court of the United States that the fish have the right of way, and it is a mistake to suppose that enforcing this right is an interference with the rights of mill-owners or of corporations.

If such mill-owners or corporations use or sell more water than belongs to them, they interfere with public rights. In no sense is the demand for sufficient water for the fish an interference with the rights of manufacturers. It is simply a question of a certain addition of steam-power to fill the gap which they themselves have made. On the other side are the public rights, and the value of the fisheries.

Salmon are re-established in the Merrimack River; and, if they have a fair chance, it is only a question of time when they will be plenty. Their worth may be estimated by the record of many rivers in Scotland and Ireland, very much smaller than the Merrimack, which bring from eighty to a hundred thousand dollars, annual rental.

The following statement is valuable, not only as showing the vast quantity of salmon on the Pacific coast, but as illustrating the private enterprise which is carrying out the work suggested by the Commissioners on fish-culture, by keeping up the supply through artificial hatching:—

“The figures of the salmon-catching industry on the Pacific coast are extraordinary. On the Columbia River alone, the catch this season amounted to 550,000 cases, or some 27,500,000 pounds, and from all the other salmon-bearing rivers of the coast, nearly as much more. The question is, Will this abundance of salmon continue? It is natural to suppose that in time, when the rivers are more disturbed, fish will diminish; but in the Columbia River, although the quantity of salmon taken has been immense, the decrease of fish has not been perceptible. But the salmon-canners of the Columbia are by no means without fears that the salmon may lessen in quantity, and, being wise men, have listened to fish-culture. Among themselves they have for the last three years been putting in young salmon at the head-waters of the river, in order to make up for the taking of the adult fish at the mouth.”

Reckoning this at the average price of salmon in the Boston and New-York markets, twenty-five cents a pound, would give \$6,875,000 as the annual product of one river.

PROPOSED STATION OF THE UNITED-STATES FISH COMMISSION AT WOOD'S HOLL.

The following letter from Professor Baird, the United-States Commissioner of fish and fisheries, will explain this important proposal:—

WOOD'S HOLL, MASS., Sept. 5, 1881.

DEAR COL. LYMAN, — The construction of a new sea-going vessel for the prosecution of fishery investigations increases the fleet of the commission to three steamers, besides the incidental launches, sail-boats, etc.; and I find it necessary, in a measure, to pull off my wings, and become established at some one station, the choice lying, perhaps, between Wood's Holl and Newport. Wherever I settle, I expect to put up the necessary piers, wharves, and all the machinery for hatching out sea-fish on a very large scale. The apparatus required for this is precisely that which is most needed in biological research, as also for the exhibition of marine

animals, etc. The principal difficulty now is the acquisition of a proper site, — one that can be controlled by the Government, and on which condition alone, expenditures necessary, amounting probably to many thousands of dollars, can be made. I am offered accommodations at Coaster's Harbor in Narragansett Bay, lately presented to the Government by the State of Rhode Island, and at Rose Island, near Newport; but personally I prefer, as more convenient and eligible in every way, the Great Harbor at Wood's Holl. There is a site which I can have for two thousand or twenty-five hundred dollars; but, until this is the property of the Government, nothing in the way of improving it can be done, and I cannot use any of my present appropriation for the purchase. Congress is as inflexible in requiring legislation by specific exactment for the acquisition of ground, as for the building of a vessel; and to begin the series of operations by asking for an appropriation for the purpose of buying a patch of ground would involve a certain lapse of two years, and possibly of four, for the ultimate success, which even then would not be an absolute certainty. It is easier to get from Congress fifty thousand dollars to improve a property than to get five hundred dollars for purchasing it, involving, as the latter would, the passage of a special law to that effect. I am myself, unfortunately, unable to buy this property, and present it to the Government; but it has occurred to me that possibly I can secure enough subscriptions at five hundred dollars each to enable me to buy the land. My plan would be to give to each subscriber, as has been done at the Naples Aquarium, the right to all the privileges of the establishment, including a table, possibly a room, use of boats, attendance, etc. I have already one subscription of five hundred dollars, and think I can get one from the American Museum of Natural History, New York. I have written to Alexander Agassiz, asking him if he would like to take a share for the museum at Cambridge. Of course, all subscriptions are made with the understanding, that, if Congress does not make the necessary appropriation to utilize the ground, the money is to be refunded to the contributors. The property could be held in trust by Mr. Fay, Mr. Forbes, or some other prominent gentleman, for the purpose in question.

The point which will interest you the most is the proposition to use it as an establishment for the propagation, on a very large scale, of sea-fishes. The chances, with the numerous pounds in the vicinity of Wood's Holl, of getting an ample quantity of all the parent-fish needed, are excellent; and as the water in the Great Harbor never freezes, and is of the very best quality besides, I think we may fairly look forward to an enormous production of winter codfish.

It will be necessary, of course, before the Government will accept the ground as a donation, for the State of Massachusetts to release jurisdiction over it; and I should like to know from you what are the chances of getting such a law through the General Court during the coming winter. Would you be willing to use your efforts towards this end?

I wish you would run down to Wood's Holl, and let me show you the site, and the excellent advantages it furnishes for the matter in question. The whole business is so closely connected with the scientific and material

welfare of New England, and of Massachusetts especially, — to say nothing of your own functions as fish commissioner, — that I think you would be very much concerned to see it satisfactorily accomplished.

Very truly yours,

SPENCER F. BAIRD.

Col. THEO. LYMAN, *Brookline, Mass.*

P.S. — I have now a second subscription of five hundred dollars.

Since the above letter was written, the subscription for the purchase of the water-lot has been finished, so that nothing now remains to carry out this enterprise so beneficial to the State but a legislative Act ceding the land to the United States; and this the Commissioners beg leave to urge on the General Court.

THEODORE LYMAN,
E. A. BRACKETT,
ASA FRENCH,

Commissioners on Inland Fisheries.

EXPENSES OF COMMISSION.

Salary	\$1,500 00
Travel and other expenses	170 00

GENERAL EXPENSES.

Subscription to fund of Penobscot breeding establishment	500 00
Subscription to fund of Schoodic breeding establishment	500 00
A. H. Powers, services and expenses at Plymouth	455 79
B. P. Chadwick, services and expenses	285 33
W. H. Foote, services and expenses	56 45
F. D. Brackett, services and expenses	168 35
R. R. Holmes, services and expenses	57 00
W. H. Day, services and expenses	34 90
E. C. Young, services and expenses at Livermore Falls	47 06
Thomas S. Holmes, services and expenses at Lawrence	77 00
W. F. Bracket, for plans at Ipswich	20 00
George E. Atchinson, services at Holyoke	75 00
Rent of land for hatching-house	50 00
Printing	57 55
Expressage	55 05
	<hr/>
	\$4,109 48

APPENDIX.

[A.]

COMMISSIONERS ON FISHERIES.

UNITED STATES.

Professor SPENCER F. BAIRD . . . Washington, D.C.

ALABAMA.

CHARLES S. G. DOSTER . . . Prattville.

D. B. HUNTLEY . . . Courtland.

ARIZONA.

JOHN J. GOSPER . . . Prescott.

RICHARD RULE . . . Tombstone.

Dr. J. H. TAGGART . . . Yuma.

ARKANSAS.

N. B. PEARCE . . . Osage Mills.

JAMES HOMBROOK . . . Little Rock.

JOHN E. REARDON . . . Little Rock.

CALIFORNIA.

S. R. THROCKMORTON . . . San Francisco.

B. B. REDDING . . . San Francisco.

J. D. FARWELL . . . Alameda.

COLORADO.

W. E. SISTEY . . . Brookvale.

CONNECTICUT.

W. M. HUDSON . . . Hartford.

ROBERT G. PIKE . . . Middletown.

JAMES A. BILL . . . Lyme.

GEORGIA.

J. T. HENDERSON, commissioner of agriculture
and *ex-officio* commissioner of fisheries . . . Atlanta.

Dr. H. H. CAREY, superintendent of fisheries . . . La Grange.

ILLINOIS.

N. K. FAIRBANK	Chicago.
S. P. BARTLETT	Quincy.
S. P. McDOLL	Aurora.

IOWA.

B. F. SHAW	Anamosa.
A. A. MOSHER, assistant for north-western por- tion	Spirit Lake.

KANSAS.

D. B. LONG	Ellsworth.
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KENTUCKY.

WILLIAM GRIFFITH, pres., 166 West Main Street .	Louisville.
JOHN B. WALKER	Madisonville.
Hon. C. J. WALTON	Munfordsville.
Hon. JOHN A. STEELE	Versailles.
W. C. PRICE	Danville.
P. H. DARBY	Princeton.
Dr. S. W. COOMBS	Bowling Green.
Dr. W. VAN ANTWERPT	Mt. Sterling.
Hon. J. M. CHAMBERS	Independence.
A. H. GOBLE	Catlettsburg.

MAINE.

HENRY O. STANLEY	Dixfield.
E. M. STILWELL, assistant commissioner . . .	Bangor.

MARYLAND.

T. B. FERGUSON	Baltimore.
THOMAS HUGHLETT	Easton.

MASSACHUSETTS.

THEODORE LYMAN	Brookline.
E. A. BRACKETT	Winchester.
ASA FRENCH	Boston.

MICHIGAN.

ELI R. MILLER	Richland.
A. J. KELLOGG	Detroit.
Dr. J. C. PARKER	Grand Rapids.

MINNESOTA.

First District, DANIEL CAMERON	La Crescent.
Second District, WILLIAM W. SWENEY, M.D. .	Red Wing.
Third District, R. OMSBY SWENEY, chairman .	St. Paul.

MISSOURI.

I. G. W. STEEDMAN, chairman, No. 2803 Pine St.	St. Louis.
JOHN REID	Lexington.
SILAS WOODSON	St. Joseph.

NEVADA.

H. G. PARKER	Carson City.
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NEW HAMPSHIRE.

Dr. EDWARD SPAULDING	Nashua.
LUTHER HAYES	South Milton.
ALBINA H. POWERS	Plymouth.

NEW JERSEY.

Dr. B. P. HOWELL	Woodbury.
Col. E. J. ANDERSON	Trenton.
THEODORE MORFORD	Newton.

NEW YORK.

R. BARNWELL ROOSEVELT, 76 Chambers Street .	New York.
EDWARD M. SMITH	Rochester.
RICHARD U. SHERMAN	New Hartford.
EUGENE G. BLACKFORD, 809 Bedford Avenue .	Brooklyn.

NORTH CAROLINA.

Hon. MONTFORD MCGEHEE, commissioner of ag- riculture	Raleigh.
S. G. WORTH, superintendent of fisheries . .	Morgantown.

NEBRASKA.

ROBERT R. LIVINGSTON	Plattsmouth.
H. S. KALEY	Red Cloud.
W. L. MAY	Fremont.

OHIO.

C. W. BOND, president	Toledo.
H. C. POST, treasurer	Sandusky.
L. A. HARRIS, secretary	Cincinnati.

PENNSYLVANIA.

H. J. REEDER	Easton.
BENJAMIN L. HEWIT	Hollidaysburg.
JAMES DUFFY	Marietta.
JOHN HUMMEL	Selinsgrove.
ROBERT DALZEL	Pittsburg.
G. M. MILLER	Wilkesbarre.

RHODE ISLAND.

ALFRED A. REED	Providence.
JOHN H. BARDEN	Rockland.
NEWTON DEXTER	Providence.

SOUTH CAROLINA.

A. P. BUTLER	Hamburg.
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TENNESSEE.

W. W. McDOWELL	Memphis.
GEORGE F. AKERS	Nashville.
H. H. SNEED	Chattanooga.

TEXAS.

J. H. DINKINS	Austin.
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UTAH.

Professor J. L. BARFOOT, curator Desert Museum .	Salt-Lake City.
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VERMONT.

HERBERT BRAINERD	St. Albans.
H. A. CUTTING	Lunenburg.

VIRGINIA.

Col. MARSHALL McDONALD	Lexington.
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WEST VIRGINIA.

HENRY B. MILLER	Wheeling.
CHRISTIAN S. WHITE	Romney.
N. M. LOWRY	Hinton.

WISCONSIN.

The Governor, <i>ex officio</i>	Madison.
PHILO DUNNING, president	Madison.
J. V. JONES	Oshkosh.
C. VALENTINE, secretary and treasurer	Janesville.
MARK DOUGLAS	Melrose.
JOHN F. ANTISDEL	Milwaukee.
CHRISTOPHER HUTCHISON	Beetown.
H. W. WELSHER, superintendent	Madison.

WYOMING TERRITORY.

HENRY B. RUMSEY	Red Buttes.
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Deputies.

Dr. M. C. BARCKWELL	Cheyenne.
OTTO GRAMM	Laramie.

CANADA.

W. F. WHITCHER	Ottawa, Ontario.
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NEW BRUNSWICK.

W. H. VENNING, inspector of fisheries	St. John.
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NOVA SCOTIA.

W. H. ROGERS, inspector of fisheries	Amherst.
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PRINCE EDWARD ISLAND.

J. H. DUVAR, inspector of fisheries	Alberton.
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BRITISH COLUMBIA.

ALEX. C. ANDERSON, inspector of fisheries	Victoria.
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[B.]

LIST OF PONDS LEASED

By the Commissioners on Inland Fisheries, under Authority given by Chap. 384, Sect. 9, of the Acts of 1869.¹

1870.

- Feb. 1. Waushakum Pond, in Framingham, to Sturtevant and others, 20 years.
April 1. Mendon Pond, in Mendon, to Leonard T. Wilson and another, 20 years.
Sept. 12. Baptist Lake, in Newton, to J. F. C. Hyde and others, 20 years.
Oct. 15. Archer's Pond, in Wrentham, to William E. George, 15 years.

1871.

- Jan. 10. Nine-Mile Pond, in Wilbraham, to B. F. Bowles, 10 years.
30. Little Pond, in Falmouth, to F. H. Dimmick, 10 years.
April —. Spectacle, Triangle, and Peters Ponds, in Sandwich, to G. L. Fessenden and another, 5 years.
17. Long Pond, in Falmouth, to Joshua S. Bowerman and three others, 20 years.
May 15. Pratt's Pond, in Upton, to D. W. Batcheller, 20 years.
18. Little Sandy Pond, in Plymouth, to William E. Perkins, 15 years.
Nov. 1. Punkapoag Pond, in Randolph and Canton, to Henry L. Pierce, 20 years.

1872.

- Jan. 1. Sandy Pond, Forest Lake, or Flint's Pond, in Lincoln, to James L. Chapin and others, 20 years.
July 20. Little Pond, in Braintree, to Eben Denton and others, 20 years.

1873.

- May 1. Meeting-house Pond, in Westminster, to inhabitants of Westminster, 15 years.

¹ We would remind lessees of ponds that they are required, by their leases, to use all reasonable efforts to stock their ponds, and keep accurate records of the same, and make returns of their doings to the Commissioners on the *1st of October*, each year, of the number and species of fish which they have put in or removed from their ponds. Any failure to comply with these conditions is a breach of contract invalidating their lease. It is important that the State should know just what is being done; and, where there appears to be mismanagement or apparent failure, the Commissioners will visit the ponds, and ascertain, if possible, the cause.

1873.

- May 1. Great Pond, in Weymouth, to James L. Bates and others, 15 years.
- July 1. Little Sandy Pond, in Pembroke, to A. C. Brigham and others, 16 years.
- Sept. 1. Pontoosuc Lake, in Pittsfield and Lanesborough, to E. H. Kellogg and others, 15 years.
- Oct. 1. Farm Pond, in Sherborn, to inhabitants of Sherborn, 15 years.
1. Spot Pond, in Stoneham, to inhabitants of Stoneham, 15 years.
- Nov. 1. Lake Chaubunagungamong, or Big Pond, in Webster, to inhabitants of Webster, 5 years.
- Dec. 1. Lake Wauban, in Needham, to Hollis Hunnewell, 20 years.

1874.

- Mar. 1. Walden and White Ponds, in Concord, to inhabitants of Concord, 15 years.
2. Upper Naumkeag, in Ashburnham, to inhabitants of Ashburnham, 20 years.
- April 1. Elder's Pond, in Lakeville, to inhabitants of Lakeville, 15 years.
20. North and South Podunk Ponds, in Brookfield, to inhabitants of Brookfield, 15 years.
- May 1. Maquan Pond, in Hanson, to the inhabitants of Hanson, 15 years.
2. Brown's Pond, in Peabody, to John L. Shorey, 15 years.
16. Wickaboag Pond, in West Brookfield, to Lemuel Fullam, 15 years.
20. Unchechewalom and Massapog Ponds, to the inhabitants of Lunenburg, 20 years.
- July 1. Hardy's Pond, in Waltham, to H. E. Priest and others, 15 years.
1. Hockomocko Pond, in Westborough, to L. N. Fairbanks and others, 15 years.
11. Mitchell's Pond, in Boxford, to R. M. Cross and others, 15 years.
11. Hazzard's Pond, in Russell, to N. D. Parks and others, 20 years.
- Oct. 1. East Waushacum Pond, in Sterling, to inhabitants of Sterling, 20 years.
20. Middleton Pond, in Middleton, to inhabitants of Middleton, 15 years.

1875.

- Jan. 1. White and Goose Ponds, in Chatham, to George W. Davis, 15 years.
- Mar. 1. Lake Pleasant, in Montague, to inhabitants of Montague, 10 years.
1. Hood's Pond, in Ipswich and Topsfield, to inhabitants of Topsfield, 15 years.

1875.

- April 1. Chauncey Pond, in Westborough, to inhabitants of Westborough, 15 years.
3. West's Pond, in Bolton, to J. D. Hurlburt and others, 15 years.
15. Gates Pond, in Berlin, to E. H. Hartshorn and others, 15 years.
24. Pleasant Pond, in Wenham, to inhabitants of Wenham, 15 years.
- May 1. Morse's Pond, in Needham, to Edmund M. Wood, 15 years.
1. Great Pond, in North Andover, to Eben Sutton and others, 20 years.
1. Chilmark Pond, in Chilmark, to J. Nickerson and others, agents, 20 years.
- July 1. Winter Pond and Wedge Pond, in Winchester, to inhabitants of Winchester, 15 years.
1. Haggett's Pond, in Andover, to inhabitants of Andover, 20 years.
- Aug. 1. Oyster Pond, in Edgartown, to J. H. Smith and others, 20 years.
7. West Waushacum Pond, in Sterling, to inhabitants of Sterling, 20 years.
9. Mystic (Upper) Pond, in Winchester, Medford, and Arlington, to inhabitants of Winchester and Medford, 15 years.
- Oct. 1. Little Chauncey and Solomon Ponds, in Northborough, to inhabitants of Northborough, 15 years.

1876.

- Feb. 1. Great Sandy Bottom Pond, in Pembroke, to Israel Thrasher and others, 15 years.
- Mar. 1. Dennis Pond, in Yarmouth, to inhabitants of Yarmouth, 15 years.
1. Crystal Lake, in Wakefield, to Lyman H. Tasker and others, 15 years.
20. Lower Naumkeag Pond, in Ashburnham, to inhabitants of Ashburnham, 18 years.
28. Dennison Lake, in Winchendon, to inhabitants of Winchendon, 15 years.
28. Phillipston Pond, in Phillipston, to inhabitants of Phillipston, 20 years.
- May 8. South-west Pond, in Athol, to Adin H. Smith and others, 15 years.
- June 1. Norwich Pond, in Huntington, to inhabitants of Huntington, 20 years.
10. Dug Pond, in Natick, to W. P. Bigelow and others, 15 years.
- Oct. 1. Farm and Learned's Pond, in Framingham, to inhabitants of Framingham, 15 years.
1. Whitney's Pond, Wrentham, to inhabitants of Wrentham, 15 years.
1. Little Pond, in Barnstable, to George H. Davis, 15 years.

1877.

- Mar. 1. Nine-Mile Pond, in Wilbraham, to inhabitants of Wilbraham, 15 years.
15. Pentucket and Rock Ponds, in Georgetown, to inhabitants of Georgetown, 15 years.
Aug. 10. Onota Lake, in Pittsfield, to William H. Murray and others, 15 years.
Oct. 1. Fort, Great Spectacle, and Little Spectacle Ponds, in Lancaster, to inhabitants of Lancaster, 20 years.
1. Battacock Pond, in Groton, to George S. Graves and others, 15 years.
Nov. 1. Tispaquin Pond, in Middleborough, to Abishai Miller, 15 years.
1. Asnebumskitt Pond, in Paxton, to Ledyard Bill and others, 15 years.

1878.

- Jan. 1. Sniptuit, Long, Snow, and Mary's Ponds, in Rochester, to inhabitants of Rochester, 15 years.
Mar. 16. Asnaconcomic Pond, in Hubbardston, to Amory Jewett, jun., 15 years.
April 1. Dorrity Pond, in Millbury, to inhabitants of Millbury, 10 years.
May 1. Spectacle, Peters, and Triangle Ponds, in Sandwich, to George L. Fessenden, 10 years.
1. Bear Hill Pond and Hall Pond, in Harvard, to inhabitants of Harvard, 15 years.
July 1. Lake Buell, in Monterey and New Marlborough, to Andrew L. Hubbell and others, 5 years.
Oct. 1. Eel Pond, in Melrose, to J. A. Barrett and others, 15 years.
1. Accord Pond, in Hingham, South Scituate, and Rockland, to inhabitants of those towns, 10 years.
1. Wright's and Ashley's Ponds, in Holyoke, to Henry C. Ewing and others, 10 years.
1. Magog Pond, in Acton and Middleton, to inhabitants of Acton, 15 years.
Half-way Pond, in Plymouth, taken by Commissioners for 5 years from March 1, 1878, in accordance with provisions of Chap. 62 of the Acts of 1876.

1879.

- Feb. 1. Lake Mahkunac and Lake Overic, in Stockbridge, to inhabitants of Stockbridge, 10 years.
June 1. "Bald Pate," "Four Mile," and "Stiles" Ponds, in Boxford, to inhabitants of Boxford, 10 years.
July 1. Silver Lake, in Wilmington, to inhabitants of Wilmington, 10 years.
1. Fresh Pond, in Falmouth, to Thomas H. Lawrence, 20 years.
Oct. 1. Pomp's Pond, in Andover, to inhabitants of Andover, 15 years.
Nov. 1. Lake Quinapowitt, in Wakefield, to inhabitants of Wakefield, 14 years.

1880.

- Jan. 1. Granite-Cove Pond, in Gloucester, to David Babson, 10 years.
- Mar. 1. Lake Winthrop, in Holliston, to inhabitants of Holliston, 15 years.
15. Massapoag Pond, in Sharon, to inhabitants of Sharon, 10 years.
- May 1. Tisbury Great Pond, in Tisbury, to Allen Look and others, 10 years.
- June 1. Indian Pond, in Kingston, to inhabitants of Kingston, 10 years.
1. Jordan Pond, in Shrewsbury, to inhabitants of Shrewsbury, 15 years.
- July 1. Swan and Martin's Ponds, in North Reading, to inhabitants of North Reading, 15 years.
- Sept. 1. Herring Pond, in Eastham, to William H. Nickerson, 10 years.

1881.

- Jan. 1. Great and Job's Neck Ponds, in Edgartown, to Amos Smith and others, 15 years.
- Mar. 1. The Mill Ponds (three), in Brewster, to Valentine B. Newcomb and another, 15 years.
- May 2. Nonesuch Pond, in Weston and Natick, to W. A. Bullard and others, 15 years.
- April 1. Long Pond, in Blandford, to Samuel A. Bartholomew and another, 15 years.

[C.]

EXTRACTS FROM REPORTS ON LEASED PONDS.

To the Honorable Board of Commissioners on Inland Fisheries.

GENTLEMEN, — The town of Stockbridge, through its regular committee, beg leave to present its Third Annual Report.

We would report for the catch of fish from Lakes Mahkunac and Overic this season, ending Oct. 1, as follows : —

Fish.		Pounds.
Black bass,	1,510, weighing	1,831 $\frac{3}{4}$
Pickarel,	796, "	832
Perch,	1,749, "	505 $\frac{1}{4}$
Bull-heads,	311, "	253
Pondfish,	507, "	159 $\frac{1}{2}$
Eels,	37, "	38 $\frac{1}{2}$
Suckers,	35, "	58 $\frac{3}{4}$
<hr/> Making a total of 4,965, "		<hr/> 3,678 $\frac{3}{4}$

One land-locked salmon was reported as caught in Smith Pond, a feeder to Lake Mahkunac, weighing two pounds and a half. All of which is respectfully submitted.

W. E. GAVIT,
JOS. PINNEY,

Town Committee on Lakes and Fishing.

WESTFIELD, MASS., Oct. 1, 1881.

E. A. BRACKETT, Esq., *Commissioner on Inland Fisheries.*

Dear Sir, — On behalf of the lessees of Hazzard Pond in the town of Russell, and the Forest and Stream Club of Westfield, I desire to report, that, in accordance with the terms of the lease of said pond, there were placed in the pond, May 27, 1876, fifty-three black bass, weighing from one and a half to two and a half pounds each. On the 13th of June of the same year, five thousand land-locked salmon were also placed in the pond: these were young fish. After the pond was stocked as above, it was closed, and no fishing done for over three years, or until May 29, 1879, at which time the pond was thrown open to those who had a right to fish therein; and in one day over six hundred pounds of pickarel were taken, but no black bass or salmon. Since that date but few pickarel have been taken; but large numbers of bass have been taken, and are

taken each season. The bass are rapidly increasing; and from those placed in the pond have gone out young fish which have effectually stocked the Westfield rivers. No salmon have yet been taken; but one of the keepers informs me that he saw three in the pond at one time this season, which he should judge would weigh five pounds each, but was unable to catch one of them, he not being an adept in salmon-fishing.

The bass caught vary in size from three-fourths of a pound to four pounds and a half each, showing that there are bass one, two, three, four, and more years old in the pond.

The stocking of the pond I regard as a perfect success, as do others who are familiar with the facts.

I am, sir, yours with respect,

W. H. FOOTE,
Secretary.

PITTSFIELD, Nov. 9, 1881.

E. A. BRACKETT, Esq.

Dear Sir, — Yours of the 31st ult. was duly received, and in reply will say that I supposed that we were not obliged to make report until the 1st of December; and it seems to me that the time for making this report should be extended to that time, as most of the lessees issue permits to fish to Nov. 15 in this section. I have been unable to get all of ours in until to-day; and below you will find statement of fish taken from Onota Lake this season. None have been put in.

ESTIMATED WEIGHT.			
1,350 black bass . . .	1,687	pounds,	largest $3\frac{1}{2}$ to 4 pounds.
2,223 rock bass . . .	1,305	"	
1,576 pickerel . . .	2,463	"	largest $4\frac{1}{2}$ to $5\frac{1}{2}$ pounds.
2,532 perch . . .	820	"	
1 land-locked salmon . .	$1\frac{3}{4}$	"	
1 English carp . . .	$1\frac{1}{2}$	"	
15,904 bull-heads . . .	6,015	"	

The taking of land-locked salmon and lake trout was prohibited; but this salmon was taken before we issued our permits. We are assured that the salmon are in our lake.

With much respect, I am yours truly,

WM. H. MURRAY.

WINCHENDON, MASS., October, 1881.

E. A. BRACKETT, Esq., of the Board of Commissioners on Inland Fisheries.

Sir, — By permission of the Commissioners on Inland Fisheries, and in accordance with a vote of the town, fishing was allowed in Dennison Lake from July 1 to Nov. 1, 1881.

We have not many returns in yet of the number of fish taken; but, from verbal reports and rumors, we are of the opinion that but few fish were taken. A few black bass were taken, of from one to three pounds, and some small land-locked salmon were taken, showing that the stock-

ing of the waters was a success; but the fruits of it will appear more abundantly two or three years hence.

We think the waters well adapted for the salmon, and wish we had stocked more liberally with them and less with black bass.

E. S. MERRILL,

Chairman for the Commissioners of Winchendon, Mass.

TOPSFIELD, Nov. 2, 1881.

DEAR SIR, — I have just received your note to the selectmen, reminding them that no return had been received at your office from this town. I very much regret that it is so much behind time. I did not know that it was required. Business of all kinds has been good the past season, and so there has been less fishing at the pond than there would otherwise have been. I live on the road from the village to the pond, and consequently see most of the fishermen as they pass. I have frequently conversed with them. They think the *black bass* are not plenty. I have seen but very few of them among the fish brought home. Very fine specimens of pickerel and perch are taken, and in large quantities. I think the law has been favorable to the increase of the last-named kinds of fish. No fish have been put into the pond, so far as is known, the past year.

Very truly yours,

SAMUEL TODD,

One of the Fish Committee.

E. A. BRACKETT,

Commissioner on Inland Fisheries.

SOUTH FRAMINGHAM, MASS., Nov. 9, 1881.

E. A. BRACKETT, *Commissioner on Fisheries.*

Dear Sir, — In accordance with the provisions of our lease of Farm and Learned's Ponds, the Fish Committee make the following report: —

By a vote of the town, the ponds were opened for fishing from July 1 to Dec. 1. Of the number of bass taken from Learned's Pond it would be impossible to state with any accuracy; but a very large number of excellent bass have been taken during the season, many of over four pounds' weight. The stocking of this pond has been proved a perfect success. This pond has no inlet or outlet. We put a large number of land-locked salmon in both ponds, — I think it was the first year of the lease, — but have had no satisfactory results. Some few have been reported seen and taken from Farm Pond. The stocking of Farm Pond with white perch has also *proved perfectly* satisfactory. They are taken in good numbers, and are increasing fast, and make good fishing. Farm Pond is the receiving-basin of the Sudbury-river water-supply for Boston, and is constantly-running water.

The stocking of both ponds with black bass in Learned's, and white

perch in Farm, is a success, and is appreciated by the citizens of Framingham.

If you think it advisable to try land-locked salmon again in Farm Pond, we will do so in the spring.

I remain very truly yours,

CHAS. W. COOLIDGE,
Chairman of Fish Committee for Framingham.

[D.]

REPORTS OF B. P. CHADWICK AND W. H. FOOTE, ON
FISHERIES IN THE MERRIMACK AND CONNECTICUT
RIVERS.*To the Massachusetts Commissioners on Inland Fisheries.*

GENTLEMEN, — Having been appointed to investigate the fisheries on the Merrimack River, and enforce the laws respecting the same, I submit the following report : —

The waters of the Merrimack River, notwithstanding its being the reservoir for the drainage of seven cities and twenty-five towns, embracing a population of nearly three hundred thousand inhabitants, besides serving as a direct receptacle for nearly all the poisonous filth that runs from the many industrial enterprises in which this population is engaged, continue to run remarkably pure. Salmon have been seen in the Merrimack the present season in larger numbers than ever before for a period of twenty-five years. The fishway at Lawrence has proved itself well adapted to the wants of the Commissioners, in the propagation of fish, so far as the breeding of salmon is concerned.

The breeding-habits of salmon are not very generally understood; and especially is this so as regards the Merrimack-river fishermen. When they are better informed respecting the same, they will more readily comply with the laws protecting the breeding-grounds and the fish during the breeding-seasons.

The breeding of fish in the ponds and streams of the Commonwealth is yet in its infancy. It has, however, thus far proved itself a success much beyond what its most sanguine friends could reasonably expect. The theories and experiences of men of thought are being more generally adopted all over the State as respects the cultivation of fish. The old-fashioned, one-sided idea, that nothing can be done to permanently assist nature in the propagation of fish, is a thing of the past; and, if the present interest that has been manifested by the cities and towns throughout the State in the cultivation of fish as an article of food be sustained by liberal legislation on the part of the Commonwealth, the time is not far distant when the waters of the State may furnish an amount of food, equal, acre for acre, with that of many of the farms throughout the State.

The fishermen above Deer-Island Bridge, with a few exceptions, have shown a manifest willingness to comply with the laws in reference to

fishing. At the grounds of the Essex Company, in South Lawrence, one violation has occurred, viz., that of taking a salmon; yet, for want of sufficient proof to convict, the parties were not apprehended. At North Andover, where so many depredations were committed last season, we have every reason to believe the laws have been fully complied with. Near Mitchell's Falls, at West Haverhill, early in the season, some unknown parties commenced the using of a drift-seine; but, owing to the bed of the river being composed of sharp stones, the seine could not be drifted, and the enterprise was abandoned. On the south shore of the river, at Bradford, several attempts were made to fish in the month of June: the parties were caught in the act, and brought before the court; but, owing to the interpretation of the law by the court, the parties were discharged. On the north shore, at Haverhill, no fishing has been done, the owner of the seines being too aged and infirm to further pursue the business. At Groveland and Rock Village eight persons were arrested, charged with using illegal seines. The parties were brought before the court, judged to be guilty of the offence, and ordered to pay a fine of twenty-five dollars each, and costs; from which decision the parties appealed.

At Merrimacport, for the past three seasons, parties from New York have been somewhat extensively engaged in catching sturgeon, and canning, labelling, and selling the same as salmon. This season the parties were on the river early in July, and captured some thirty sturgeon, varying in weight from fifty to two hundred and fifty pounds. The process this season has been to dress the fish, pack in ice, and ship directly to New York. The parties were arrested under the act approved March 17, 1881 (chap. 104, sect. 2), and taken before the court at Newburyport, where they plead guilty to the charge, and paid a fine of twenty-five dollars and costs. Their boats and seines were not confiscated, the parties being allowed to retain the same upon condition that they immediately quit the business, which was quickly complied with.

At Amesbury, where the fishing business is conducted by Jonathan Morrill, a better observance of the law has been manifested this season than in any previous year. The seines were promptly removed from the river the first of June; and we hear of but one instance where a seine has been returned to the waters.

From Deer-Island Bridge to Plumb-Island Lighthouse eleven seines have been in use the present season, all of which are of illegal construction as regards the size of the mesh; the same, when being fully stretched, measuring from one to two and three-fourths inches. These seines were run, in open violation of all law, to the 17th of June, and at times since then to the 1st of August too numerous to mention. The evil effects of using seines of this description, as regards the destruction of the young fish, is a matter well known to your honorable Board.

The parties offending in this instance have not been brought before the court for several reasons, prominent among which is the fact that the line defining the mouth of the river has not been drawn by the Governor of the State, as provided for in sect. 17, chap. 384, Acts of 1869. It is hoped the Commissioners will see the immediate necessity of having

this line established, so that the fishermen may fully know their rights, and all interested parties be brought to a proper observance of the same, besides permanently settling this long-vexed question.

From personal observation, and information furnished me by the most reliable fishermen of Newburyport, I am led to believe that fully thirteen thousand grown shad have been taken, since the first of June, within a distance of five miles inside of Plumb-Island Lighthouse, besides thousands of young shad and alewives caught and sold as bait to the several fishing-vessels engaged in ocean-fishing. This business has been pursued to such an extent as to render it proper to visit the vessels, and forbid the masters of the same from taking on board young shad and alewives as bait. This request, in many instances, has been complied with, and several vessels have thus been obliged to go elsewhere for bait, obtaining the same from the fishermen who are using ocean-seines for mackerel.

In previous seasons menhaden have been numerous in the river, the catching of which has been quite a source of income to the Newburyport fisherman. This season, for some unknown cause, none have been taken or seen up to this time, Aug. 20. The absence of menhaden has made it seemingly necessary for the fishermen to substitute the young shad and alewives in their place, the fishermen not fully realizing the great injury they were doing, not only to themselves, but to the fisheries on the river above, by the destruction of so many young fish.

The catch of bait the present season, from reliable information furnished by the fishermen, and personal observation, is estimated to be not less than twenty barrels per day for ninety days, — from the 1st of May to the 1st of August. This amount, at one dollar per barrel, the price at which bait is sold, would amount to eighteen hundred dollars. The estimated amount of young shad taken during this period is based upon information furnished me by the fishermen, and personal observation, and is supposed to be not far from one barrel in every ten. Allowing three hundred of these fish to constitute a barrel (and this is a low estimate) gives the large number of fifty-four thousand young shad taken during this period for bait. Could this number of fish live to attain the usual size to which this species of fish grow, and then be sold at the moderate sum of ten dollars per hundred, which is less than two-thirds of the actual price paid for the same the present season, the amount would be fifty-four hundred dollars. If this estimate is correct, and I think it is, you will readily see that the fishermen, by pursuing their present course, are actually robbing themselves; and, further, I am credibly informed that during the long period in which the Commissioners were engaged in the artificial propagation of shad at North Andover, the fishermen on the lower part of the river were frequently engaged in catching and disposing of the young fish for bait. Should this pernicious system of fishing be longer continued, there is good reason to fear that it may eventually result in the total annihilation of the shad from the waters of the Merrimack.

It is evident that the present low condition of the fisheries of the river is mainly due to the destruction of the young fish at Newburyport.

I trust your honorable Board will give this subject due consideration,

and take such action in the premises as in your judgment may be conducive to the greatest amount of good to all parties interested.

Respectfully yours,

B. P. CHADWICK,
Deputy-Commissioner Merrimack River.

BRADFORD, Aug. 20, 1881.

To the Massachusetts Commissioners on Inland Fisheries.

GENTLEMEN, — At your request I spent two weeks investigating the fisheries at Newburyport. From personal observation, and from statements made to me by the fishermen, I fully concur in the above report.

Respectfully,

WM. H. H. DAY.

WESTFIELD, Oct. 18, 1881

E. A. BRACKETT, Esq., *Commissioner on Inland Fisheries.*

Dear Sir, — In compliance with your request, I submit the following report of my action in connection with fishway over the dam between Holyoke and South-Hadley Falls, in the Connecticut River: —

Having received many complaints from parties living in Holyoke, South Hadley, and the surrounding towns, even as far up the river as Northampton, of the depredations that were being constantly committed on this fishway, I determined to go over there, and in a private manner investigate the matter. This I did, and appeared there a stranger. I made quite a thorough investigation, and found that the most serious complaints were true, — that fish, especially lamprey eels, were taken not only from the river near the fishway, but from the fishway itself, by the thousands, and sold to parties coming long distances, even from towns in Connecticut. I determined to make a raid upon these violators of law, and called in the assistance of district police officer Kellogg of Pittsfield, together with two police officers of Westfield, Zwiner and Hedges, and two officers of Holyoke, Duhanne and Atchison, making six in our party. We laid our plans to make the raid on Monday night, June 6. We arrived on the ground about eleven o'clock, and, after watching operations for something over an hour, made a descent upon the fishway between twelve and one o'clock, and arrested ten men with several hundred lamprey eels, all of which we took across the river to the city-hall in Holyoke, and placed them in the lock-up until the next mornig, when they were arraigned before Trial-Justice Pearsons: he fixed a later day for trial, the result of which was the conviction of Frank C. Bugbee and Walter S. Sackett of South Hadley, and Michael Hogan and William Doyle of Hampden County, for taking and catching of fish in the fishway, all of whom were fined fifty dollars each, and costs. Bugbee, Sackett, and Hogan each paid their fine and costs, Doyle taking an appeal for the purpose of gaining time to raise the funds to pay his fine and costs also. A. J. Smith of Blandford was convicted of trespass on the fishway, and also fined the

sum of fifty dollars and costs, from which he also appealed; and trial will be had at the December term of court. Three men, arrested, — to wit, William M. Howes, Joel Smith, and Augustine Wilcox, — were discharged for lack of evidence to convict them. The last man, one Jerry Pelland, admitted his guilt; but by advice and consent of the court his case was continued, it appearing that he had a large family to support, consisting of a wife and several small children, and he too poor to pay a fine. He would be obliged to go to the house of correction, and his family be thrown on the town of South Hadley for support. It seemed to be a case that called for mercy; and upon his promise of good behavior I did not press his case to trial. I called in the aid of J. R. Dunbar, attorney-at-law of Westfield, as counsel to prosecute these cases, and he rendered valuable aid.

Since these arrests were made, I have received no complaints in relation to that fishway. I asked for the appointment of George E. Atchison of Holyoke as officer-in-charge of this fishway, which was granted; and Mr. Atchison has rendered efficient service in protecting the fishway from depredations. Allow me to say, in closing this report, that I have no doubt of the passage of all kinds of migratory fish up and down this fishway, unless, possibly, an exception may be made in the case of shad.

I am, sir, yours with great respect,

W. H. FOOTE,
Deputy-Commissioner.

[E.]

LEGISLATION.

[CHAP. 28.]

AN ACT TO AMEND SECTION ONE OF CHAPTER ONE HUNDRED AND FOUR OF THE ACTS OF THE YEAR EIGHTEEN HUNDRED AND SEVENTY-SIX, RELATING TO CERTAIN RETURNS TO THE COMMISSIONERS ON INLAND FISHERIES.

Be it enacted, etc., as follows :

SECTION 1. Section one of chapter one hundred and four of the acts of the year eighteen hundred and seventy-six is hereby amended by striking out the word "first," before the word "day," in the sixth line in said section, and inserting the word "twentieth."

SECT. 2. This act shall take effect upon its passage. [*Approved February 23, 1881.*]

[CHAP. 44.]

AN ACT TO REGULATE THE TAKING OF FISH IN NORTH RIVER IN THE COUNTY OF PLYMOUTH.

Be it enacted, etc., as follows :

SECTION 1. The inhabitants of the town of Pembroke are hereby permitted to take fish at the weir where they have usually caught them, on the North River, so called, or stream leading to the Indian Ponds, so called, in said town, on any secular day of the week, and at any hour of the day, and at no other time.

SECT. 2. No person or persons shall take fish from the stream leading from said North River to the said Indian Ponds, or streams tributary to the North River, excepting at the weir above mentioned, at any time between the tenth day of April and the fifteenth day of May inclusive, of each year.

SECT. 3. The selectmen or committee for the time being, of the town of Pembroke, shall, from the first running of alewives, after the tenth day of April in each year, take and deposit alive, in good condition, in Indian Ponds in said Pembroke, not less than ten thousand alewives, so they may cast their spawn in said ponds; and the expense of the same shall be borne in equal shares by the towns of Pembroke, Marshfield, Scituate and South Scituate, and said towns are hereby permitted to raise money for the same.

SECT. 4. It shall be lawful for the inhabitants of the several towns on North River to take fish on Mondays, Wednesdays and Fridays of each

week, from April first to June first inclusive, of each year, with ten seines only in the manner following, to wit: The towns of South Scituate, Scituate and Pembroke shall each have the right of disposing at public auction for their own benefit, of the privilege of catching fish with two seines only, and the town of Marshfield the right of disposing at public auction for their own benefit, of the privilege of catching fish with four seines only, in the river aforesaid.

SECT. 5. It shall be lawful for the inhabitants of the town of Hanson to take fish from Indian Head River on Mondays, Wednesdays and Fridays of each week, from April first to June first inclusive, of each year: *provided*, said inhabitants shall not be allowed to take fish at any time from said Indian Head River within eighty rods of the mouth of said river.

SECT. 6. Any person or persons who may by seine or mesh net take fish from the said North River, except such persons as have authority under this act, shall be punished for each offence by a fine not less than twenty-five nor more than one hundred dollars, or by imprisonment in the house of correction not less than one nor more than three months.

SECT. 7. Chapter two hundred and twenty-nine of the acts of the year eighteen hundred and seventy-two, and all other acts and parts of acts inconsistent with this act, are hereby repealed.

SECT. 8. This act shall take effect upon its passage. [*Approved March 2, 1881.*]

[CHAP. 47.]

AN ACT TO AMEND THE LAW REGULATING FISHING IN CONNECTICUT
RIVER AND ITS TRIBUTARIES.

Be it enacted, etc., as follows :

SECTION 1. Any person who shall take or aid or assist in taking from the Connecticut River or any of its tributaries, within the limits of this Commonwealth, any shad or alewives at any other time than between the fifteenth day of March and the first day of July in each year, shall forfeit and pay for each offence the sum of one hundred dollars.

SECT. 2. Section three of chapter seventy-six of the acts of the year eighteen hundred and sixty-nine is hereby amended by striking out the words "fifteenth day of June in each year, the meshes whereof are less than five," in the eighteenth and nineteenth lines, and inserting the words "first day of July in each year, the meshes whereof are less than two," in place thereof.

SECT. 3. Chapter three hundred and sixty-nine of the acts of the year eighteen hundred and seventy, and all acts and parts of acts inconsistent with this act, are hereby repealed.

SECT. 4. This act shall take effect upon its passage. [*Approved March 2, 1881.*]

[CHAP. 103.]

AN ACT RELATIVE TO THE TAKING OF FISH FROM THE MERRIMACK
AND CONNECTICUT RIVERS AND THEIR TRIBUTARIES.

Be it enacted, etc., as follows :

SECTION 1. Nothing in the provisions of chapter two hundred of the acts of the year eighteen hundred and eighty shall be construed as giving authority to take or catch fish of any kind within four hundred yards of any fishway on the Merrimack River or its tributaries, or within two hundred yards of any fishway on the Connecticut River or its tributaries, lying within this Commonwealth.

SECT. 2. This act shall take effect upon its passage. [*Approved March 17, 1881.*]

[CHAP. 104.]

AN ACT TO REGULATE FISHING IN THE MERRIMACK RIVER.

Be it enacted, etc., as follows :

SECTION 1. Whoever takes or catches any shad or alewives in any part of the Merrimack River, or its tributaries, lying within this Commonwealth, except between sunrise on Monday morning and sunrise on Friday morning, of each week, from the first day of March to the last day of May, inclusive, in each year, shall forfeit for each alewife so taken a sum not less than one dollar nor more than five dollars, and for each shad so taken a sum not less than five nor more than twenty dollars.

SECT. 2. Whoever uses a net of any kind or description in the waters of the Merrimack River, or its tributaries, lying within this Commonwealth, from the first day of June in each year to the last day of February in the year next succeeding, inclusive, shall forfeit for each offence the sum of twenty-five dollars.

SECT. 3. Section one of chapter one hundred and forty-four of the acts of the year eighteen hundred and seventy-four is hereby repealed.

SECT. 4. This act shall take effect upon its passage. [*Approved March 17, 1881.*]

[CHAP. 270.]

AN ACT TO PROVIDE FOR THE PRESERVATION OF LOBSTERS.

Be it enacted, etc., as follows :

SECTION 1. Whoever, from the twentieth day of June to the twentieth day of September, takes a lobster, shall be punished for each offence by a fine of not less than ten nor more than one hundred dollars, or by imprisonment in the house of correction for not less than one nor more than three months; but a person catching a lobster when lawfully fishing, and immediately returning it alive to the waters from which it was taken, shall not be subject to such penalty.

SECT. 2. Whoever from the twentieth of June to the twentieth of September buys, sells, or has in his possession a lobster taken in this

Commonwealth, shall forfeit for each offence a sum not less than ten nor more than fifty dollars.

SECT. 3. The mayor and aldermen of every city, the selectmen of every town and all police officers and constables shall cause the provisions of this act to be enforced in their respective cities and towns; and all penalties for violations thereof shall be paid one-half to the person making the complaint, and one-half to the city or town in which the offence was committed.

SECT. 4. This act shall take effect upon the first day of January, eighteen hundred and eighty-two. [*Approved May 12, 1881.*]

[F.]

RETURNS OF WEIRS, SEINES, AND GILL-NETS.

RETURNS from sixty-four weirs, seventeen sea-seines, and sixty-one gill-nets have been received, as against sixty-six, twenty-six, and seventy-one, respectively, for the year 1880. The decrease may, in part, be owing to the fact that a certain number of men annually go out of the business, and their successors fail to make application for blanks. On the whole, the number of nets was probably about the same for the two years. By chap. 28, Acts 1881, the season during which returns are to be made was extended to Oct. 20, which would make an increase of the gross catch, because a few of the weirs are kept down until that date. Taking the combined catch of those three sorts of nets, there was this year, as compared with the last, a *decrease* for sea-herring (to one-half), flounders (small), menhaden (almost a disappearance), bluefish (small), and eels (slight). And there was an *increase* for shad (double), mackerel (three times), and scup (nearly three times). On the whole, it may be said that the severe winter and succeeding cool summer were unfavorable for the sea fisheries. When to the number of alewives there are added the returns of fresh-water fisheries, the total catch shows, not a slight decrease, but a large increase. The shad fishery of the Taunton River more than held its own, while that of the Connecticut jumped from 7,727 in 1880 to 38,382 in 1881; and the latter number would have been much greater had it not been for the floating logs which impeded the nets. This fine run was due, in part, to the high water, which excited the fish to push up stream, and made the passage of obstacles, like the dam at Windsor Locks, an easy one. The shad fishery of the Merrimack is, on the contrary, almost at an end, from causes which are explained in the preceding pages.



TABLES.

TABLE NO. I.—POUNDS AND WEIRS. — Showing the Catch of each during 1881.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Striped Bass.	Alewives.	Squeteague.	Mackerel.	Spanish Mackerel.	Tautog.	Pounders and Flat-fish.	Scup.	Menhaden.	Bluefish.	Hels.
Centreville	T. F. Phinney & Co.	1,402	-	3	15,126	180	45	-	15	1,172	480,180	349	407	56
Brewster	Freeman Atwood.	26	-	300	-	1	6,705	-	110	-	-	1	2,192	93
"	Ellis & Cahoon	-	-	-	3,534	-	-	-	303	-	-	-	10,449	-
"	V. B. Newcomb	91	-	-	10,218	-	82,450	-	-	-	-	-	-	-
"	Parker & Ellis	1	-	228	36	-	3,979	-	32	-	-	-	1,057	-
"	J. R. Wixon	58	-	1	5,039	-	28,636	-	92	12	3	-	23	-
East Brewster	Thaddeus Ellis, jun.	-	-	17	1,636	-	3,616	-	595	-	-	-	5,582	3
Orleans	Isaac Hopkins	-	-	-	-	-	-	-	-	-	-	-	5,126	-
"	Robert E. Oliver	-	-	5	200	-	833	-	104	-	-	-	12,554	-
"	A. L. Walker	5	-	14	257	-	99	-	84	43	-	-	15,446	2
Wellfleet	N. B. & S. B. Rich	25	11,700	-	255	7	1,175	-	171	3	-	-	1,177	42
"	J. A. Young	6	24	-	-	-	-	-	-	-	-	-	3,189	-
Eastham	Isaiah H. Horton	-	-	-	-	-	800	-	-	-	-	-	24,560	-
"	E. F. Knowles	100	247	226	508	90	966	25	300	183	50	326	10,393	187

"	.	.	N. M. Knowles	-	-	-	1,600	-	-	-	-	-	-	-	-	-	-	-	-
"	.	.	W. H. Nickerson .	-	-	-	337	-	-	-	-	-	-	-	-	-	-	-	-
"	.	.	James Savage	-	-	11,600	-	107	42,721	-	-	-	-	-	-	-	-	-	-
"	.	.	Philip Smith .	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
North Truro	.	.	C. H. Collins .	-	-	5,595	-	-	-	-	-	-	-	-	-	-	-	-	-
"	.	.	P. L. Paine & Co..	86	61,355	-	8,392	9	154,154	-	94	5,354	71	21	1,281	-	-	-	-
Chatham	.	.	S. F. Bearse .	2,177	-	-	94,770	-	368,032	-	-	-	-	-	-	-	-	-	-
"	.	.	Reed, Loveland, & Co.	3,600	771,700	-	25,763	-	281,099	-	-	-	-	-	-	-	-	-	-
"	.	.	George W. Reynolds & Co.	3,852	184,832	-	109,882	5	63,923	-	16	4,336	80	40	3	-	-	-	-
"	.	.	Asa Rogers .	1,442	24,671	-	35,413	-	249,540	-	70	910	290	126	2	29	-	-	-
"	.	.	Village Weir Co. .	1,477	125,534	-	17,094	-	172,817	-	-	-	-	-	-	-	-	-	-
Harwich	.	.	J. W. Eldredge .	1,286	-	-	13,907	686	35,214	-	250	705	53,948	23	335	18	-	-	-
"	.	.	Taylor & Megathlin	283	1,974	-	12,044	8	37	-	11	820	37	131	3	14	-	-	-
"	.	.	D. F. Weeks	1,197	1,750	1	10,412	208	35	-	24	2,040	2,029	2,128	920	-	-	-	-
Dennis	.	.	A. T. Chase .	92	-	-	9,400	-	-	-	-	-	-	-	1,677	-	-	-	-
"	.	.	Deep-water Weir Co..	63	32,650	-	8,094	2	89,853	-	407	539	8	-	257	1	-	-	-
"	.	.	Nobcussett Fish Weir Co..	214	598	330	-	-	15,369	-	-	-	-	-	-	-	-	-	-
Waquoit	.	.	T. J. Phinney	105	424	5	30,074	134	8	-	83	6,798	1,733	1,350	191	57	-	-	-
Wood's Holl	.	.	John Rogers *	22	-	-	12,102	4,472	3,960	-	2,380	3,212	133,960	112	518	-	-	-	-
Yarmouthport	.	.	D. B. Crocker	20	-	130	-	-	5,043	-	9	-	3	-	3,714	-	-	-	-
"	.	.	Benjamin Lovell .	1	136	14	87	-	12,224	-	-	-	-	-	622	-	-	-	-
Falmouth	.	.	Wood's Holl Weir Co.	36	-	-	12,000	27,375	-	3	530	-	31,456	-	1,209	-	-	-	-

* 2 pounds set.

TABLE No. I. — Concluded.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Striped Bass.	Alwives.	Squeteague.	Mackerel.	Spanish Mackerel.	Tautog.	Flounders and Flat.	Scup.	Menhaden.	Bluefish.	Kels.
Matapoisett	A. B. Bowman	1	1	1	7,376	820	-	7	776	889	8,695	-	2,305	-
"	J. B. Dunn	23	11	-	11,349	1,370	2	-	1,020	1,479	39,150	1,825	45	43
Fairhaven.	J. C. & J. J. Allen	7	-	68	5,494	170	24	9	1,118	597	155,880	45	128	22
"	D. W. Deane	5	-	61	11,306	732	73	2	4,582	3,684	88,737	1,015	557	1,049
"	D. W. Deane	11	-	40	12,392	745	1	-	1,876	2,289	61,288	1,090	103	94
"	George R. Deane	9	3	10	6,689	379	73	-	1,161	1,977	178,773	100	216	59
"	S. P. Dunn	18	-	55	10,550	393	162	-	2,485	1,243	82,136	-	135	4
"	George L. Hiller	4	-	5	17,262	619	78	-	2,512	1,386	681	657	119	46
"	Oliver Lapham	36	1	8	19,875	1,762	41	-	3,835	1,504	323,999	1,018	2,018	76
"	R. W. Pease	-	-	36	1,877	236	1	-	348	142	4,585	400	160	162
"	D. C. Potter	-	-	-	-	117	-	-	5	-	151	38	1,045	-
"	C. D. Sherman	7	-	6	1,881	650	18	-	98	257	48,208	44	78	392
"	Jared Sherman	15	-	-	3,786	2,275	31	1	-	287	42,863	7	385	-
"	George R. Wixon.	-	-	-	-	13	-	2	-	-	-	-	867	-
Chilmark	R. Flanders & Co.	32	-	5	13,387	2,305	2,194	-	111	449	12,462	-	100	-
"	H. O. Poole	76	1,040	6	24,891	4,653	2,827	-	162	7,503	31,173	12	721	-
South Dartmouth	Manuel Joseph	109	6,535	5	580	808	20	8	512	2,913	43,467	3,105	82	4
"	John Meatras	16	10,169	11	1,001	518	4	7	304	2,903	22,050	-	95	29

[illegible]

TABLE NO. II. — SALT-WATER SEINES. — Showing the Catch of each for 1881.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Striped Bass.	Alewives.	Scup.	Squeteague.	Mackerel.	Tautog.	Flounders and Flat-fish.	Bluefish.	Menhaden.	Eels.	Frost-fish.	Perch.	Smelts.
Provincetown.	T. K. Paine.	.	1,535	.	.	.	.	.	.	.	2,012	.	.	.	.	.
Eastham.	R. Doane.	.	.	.	.	.	.	.	.	.	3,278	.	.	.	.	.
"	W. H. Knowles.	.	38	.	12	.	.	776	.	.	3,726	5	.	.	.	.
"	L. Lombard.	.	.	.	.	.	.	.	.	.	5,910	.	.	.	.	.
"	James Penniman.	.	.	.	.	.	.	2,667	.	.	9,346	.	.	.	.	.
"	C. H. Smith.	.	.	.	.	.	.	2,263	.	.	5,466	.	.	.	.	.
Chatham.	John Gould & Co.	2	.	.	472	.	.	3,871	.	.	1,778	.	.	.	.	.
"	H. Howes.	.	.	516	.	.	.	.	.	.	1,148	.	.	.	.	.
Yarmouth.	H. E. Baker.	44	.	17	11,000	.	.	.	.	490	.	.	229	.	.	.
Hyannis.	B. F. Lambert.	.	.	65	.	358	.	.	.	.	1,299	.	.	.	.	.
Westport.	S. G. Allen.	.	.	4	1,453	.	1	.	.	.	.	773	55	.	.	.
"	P. Kirby.	.	.	26	614	.	.	.	.	4	.	.	139	1,692	472	2,414
Chilmark.	J. W. Mayhew.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Tisbury.	Allen Look.	.	.	.	14,868	.	.	.	100	.	.	.	.	.	.	32,800
Edgartown.	J. H. Smith.	.	.	.	427,748	.	.	.	304	.	.	.	6,312	.	6,466	.
Nantucket.	R. K. Dunham.	.	.	.	31,959	.	.	.	.	10	1,520	.	259	.	.	.
"	G. Phinney.	.	.	27	.	50	.	.	.	.	.	.	.	.	.	.
"	.	.	.	.	1,480	.	.	.	.	.	.	.	.	.	.	.
Total.	.	46	1,573	655	489,606	408	1	9,577	404	504	35,483	778	6,994	1,692	6,938	35,214

TABLE No. III. — GILL-NETS. — Showing the Catch of each for 1881.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Striped Bass.	Alewives.	Scup.	Squeteague.	Mackerel.	Tautog.	Flounders and Flat-fish.	Bluefish.	Menhaden.	Eels.	Spanish Mackerel.
Barnstable	W. F. Carney	.	.	.	.	.	.	.	.	.	1,069	.	.	.
"	Moses Sturgis	.	.	.	.	11	4	.	.	.	300	.	.	.
Dennis	F. S. Crowell.	.	.	.	.	.	.	.	.	.	100	.	.	.
"	Venez Kelley	.	.	.	.	.	.	.	.	.	2,303	.	.	.
Provincetown	James A. Atkins	.	.	.	.	.	.	.	.	.	9,859	.	.	.
"	Joshua Atkins	.	.	.	.	.	.	.	.	.	536	.	.	.
"	D. W. Atwood	.	8,930	.	.	.	.	.	.	.	6,911	.	.	.
"	Paul L. Bangs	124	23,443	.	.	.	.	14,970	.	.	741	.	.	.
"	F. M. Bowley	.	1,830	.	.	.	.	2,195	.	.	.	.	.	.
"	E. Doane	.	8,269	.	.	.	.	2,199	.	.	980	.	.	.
"	J. B. Dyer	.	1,885	.	.	.	.	2,782	.	.	.	.	.	.
"	H. Freeman	.	.	.	.	.	.	2,390	.	.	1,267	.	.	.
"	Prince Freeman	.	7,475	.	.	.	.	875	.	.	652	.	.	.
"	John Genn	.	8,715	.	.	.	.	.	.	.	411	.	.	.
"	J. C. P. Harvender	.	19,005	.	.	.	.	19,344	.	589	.	103	.	.
"	Levi B. Kelley	.	15,621	.	.	.	.	11,867	.	.	36	.	.	.
"	Benjamin Lewis	.	11,602	.	.	.	.	4,284	.	.	907	.	.	.

TABLE No. III. — Continued.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Striped Bass.	Alwives.	Scup.	Squeteague.	Macarel.	Tautog.	Flounders and Flat-fish.	Bluefish.	Menhaden.	Eels.	Spanish Macarel.
Provincetown .	George Lewis	.	4,400	-	-	-	-	13,674	-	-	793	-	-	-
"	Thomas Lewis	.	-	-	-	-	-	12,688	-	-	203	-	-	-
"	Joseph Mayo .	163	15,215	-	-	-	-	22,199	-	-	-	-	-	-
"	James G. Rand	.	-	-	4,000	-	-	15,601	-	-	661	-	-	-
"	Reuben Ryder	.	8,687	-	-	-	-	1,425	-	-	1,007	-	-	-
"	Joseph Sears .	246	32,559	-	1,093	-	-	11,223	-	189	1,116	-	-	-
"	Isaac Small .	.	2,680	-	-	-	-	1,145	-	-	978	-	-	-
"	W. C. Snow .	.	-	-	-	-	-	-	-	-	537	-	-	-
"	Reuben Swift.	.	8,450	-	-	-	-	4,399	-	-	971	-	-	-
"	Isaac Tyler .	.	3,461	-	-	-	-	9,894	-	-	388	-	-	-
"	Reuben Wareham .	.	11,350	-	-	-	-	6,973	-	-	781	-	-	-
"	John C. Weeks	.	14,445	-	-	-	-	3,255	-	-	915	-	-	-
"	Joseph E. Weeks .	.	-	-	-	-	-	11,873	-	-	976	-	-	-
South Truro .	Freeman & Collins	65	44,100	-	12,000	-	-	166,100	480	-	3,775	-	-	-
Truro .	C. N. Grozier	.	5,000	-	-	-	-	2,036	-	-	268	-	-	-
"	R. S. Small .	.	-	-	-	-	-	4,262	-	-	48	-	-	-
"	Isaac Smith .	.	-	-	-	-	-	2,307	-	-	411	-	-	-
"	E. P. Worthen	.	-	-	-	-	-	2,872	-	-	-	-	-	-

North Truro	Benjamin Coan . . . . .	.	.	.	.	.	.	.	.	1,699	.	.	.	.	.	214	.	.	.
North Eastham	Eldad Dill . . . . .	.	.	.	.	.	.	.	.	2,449	.	.	.	.	.	-	.	.	.
Orleans	Jabez Sparrow . . . . .	.	.	.	.	.	.	.	.	4,891	.	.	.	.	.	1,459	.	.	.
South Orleans	H. S. Rogers . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5,010	.	.	.
Chatham	Alpheus Mayo . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1,949	.	.	.
"	William Patterson . . . . .	.	.	.	.	.	.	.	.	2,813	.	.	.	.	.	-	.	.	.
"	J. F. Smith . . . . .	.	.	.	.	.	.	.	.	6,175	.	.	.	.	.	-	.	.	.
Hyannis	David Bearse* . . . . .	.	.	.	.	.	.	.	.	.	83	12	.	.	.	-	.	.	124
Centreville	C. E. Bearse † . . . . .	.	.	.	.	.	.	.	.	.	1,453	27	.	.	.	1	.	.	1,560
"	W. W. Hallett . . . . .	.	.	.	.	.	.	.	.	.	1,519	17	.	.	2	-	.	.	1,021
"	H. F. Kelley . . . . .	.	.	.	.	.	.	.	.	.	1,991	19	.	.	.	2,485	.	.	1,346
Cotuit Port	N. N. Cook . . . . .	.	.	.	.	.	.	.	.	.	.	-	.	.	.	-	.	.	1,272
"	James A. Fish . . . . .	.	.	.	.	.	.	.	.	.	1,714	-	.	.	363	-	.	.	2,315
Cotuit	David P. Nickerson . . . . .	.	.	.	.	.	.	.	.	.	159	12	.	.	28	-	.	.	1,267
"	David Rogers . . . . .	.	.	.	.	.	.	.	.	.	127	-	.	.	.	-	.	.	6,731
Falmouth	Henry G. Fisher . . . . .	.	.	.	.	.	.	.	.	.	10	30	.	.	.	20	.	.	750
"	R. T. Handy . . . . .	.	.	.	.	.	.	.	.	472	55	357	16	312	4,873	1,220	739	157	-
"	W. Small . . . . .	.	.	.	.	.	.	.	.	-	1	6	-	-	1	377	-	-	-
Fairhaven	D. W. Deane . . . . .	.	.	.	.	.	.	.	.	-	-	182	-	10	-	1,597	360	-	-
"	S. P. Dunn . . . . .	.	.	.	.	.	.	.	.	-	-	188	-	-	-	407	-	-	-
Nantucket	A. H. Adams . . . . .	.	.	.	.	.	.	.	.	-	-	12	-	-	-	1,452	-	-	-
"	J. B. Brooks . . . . .	.	.	.	.	.	.	.	.	-	-	9	-	-	-	1,164	-	-	-

* Also 10 sea bass.

† Also 172 rock bass.

TABLE No. III. — Concluded.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Striped Bass.	Alewives.	Scup.	Squeteague.	Mackerel.	Tautog.	Flounders and Flat-fish.	Bluefish.	Menhaden.	Eels.	Spanish Mackerel.
Nantucket	H. B. Cash	.	.	.	.	32	15	5	.	.	4,377	.	.	.
"	J. O. Freeman	.	.	.	.	.	.	.	.	.	1,606	.	.	.
"	W. F. Ramsdell	.	7,050	.	.	.	234	.	.	.	3,533	.	.	.
"	J. Small & Son	.	.	.	.	.	.	.	.	.	22,244	.	.	.
	Total	685	264,644	58	107,127	17,095	1,118	371,457	1,195	8,158	102,884	1,202	157	5

TABLE NO. IV. — CONNECTICUT-RIVER SEINES.

TOWN.	NAME.	Shad.	Pike.	Alewives.	Striped Bass.
Agawam	A. Converse	2,152	-	-	-
"	A. J. Hills	1,309	-	-	-
South Hadley	C. C. Smith	18,196	11	125	4
Chicopee	J. and H. N. Chapin	16,725	-	-	-
	Total	38,382	11	125	4

TABLE NO. V. — MERRIMACK-RIVER SEINES.

TOWN.	NAME.	Shad.	Alewives.	Salmon.
Lawrence	H. S. Neal	107	-	-
North Andover	E. Sutton	289	-	2
Bradford	W. H. H. Day	92	-	-
Newbury	A. E. Larkin	-	500	-
"	J. P. Newton	-	7,500	-
Amesbury	J. Morrill	704	-	-
	Total	1,192	8,000	2

TABLE NO. VI. — TAUNTON-RIVER SEINES.

TOWN.	NAME.	Shad.	Alewives.	Striped Bass.
Berkley	I. N. Babbitt	1,149	161,987	-
"	F. P. Case	483	166,441	5
"	Nichols & Shove	875	212,000	-
Dighton	N. Chase and others	479	68,700	-
"	E. Hathaway	1,000	150,000	-
Middleborough	John Garland	-	87,180	-
Raynham	J. S. Townsend & Brother	868	147,400	-
"	G. B. and E. Williams	333	168,287	-
Taunton	J. W. Hart	548	157,879	-
Somerset	George H. Simmons	4	24,526	-
	Total	5,739	1,344,400	5

TABLE NO. VII. — OTHER FRESH-WATER SEINES, OR DIP-NET FISHERIES.

TOWN OR PLACE.	NAME.	Shad.	Alewives.	Frost-fish.	Flat-fish.	Perch.
Weymouth	Weymouth Iron Company	-	132,100	-	-	-
Kingston	Cobb & Drew	-	26,161	-	-	-
Plymouth	William S. Hadaway	-	-	86,000	-	-
Sandwich	H. G. O. Ellis	2	126,700	-	-	-
Barnstable	Clark Lincoln	-	662,040	-	-	-
"	Russell Marston	-	23,440	-	-	-
Brewster	Wixon & Newcomb	-	836,586	-	-	-
Wellfleet	N. C. Nicholson	-	28,073	-	-	-
Dennis	W. Crowell	-	4,859	-	-	-
Yarmouth	D. S. Baker	-	9,200	-	-	-
"	Nathan W. Grush	-	196,313	52	1,152	3,829
Mashpee	David Lovell	-	5,600	-	-	-
"	W. R. Mingo	-	42,400	-	-	-
"	George T. Oakley*	-	8,750	-	-	-
"	W. H. Simons	-	3,670	-	-	-
Wareham	George Sanford	-	288,800	-	-	-
Mattapoissett and Rochester	A. H. Shurtleff	-	245,671	-	-	-
Rochester	A. Rouns ville	-	30,024	-	-	-
Westport	L. W. White	-	583	-	-	366
Chilmark	Estate of H. M. Smith	-	52,277	-	-	-
	Total	2	2,723,247	86,052	1,152	4,195


* Also 1 striped bass.

TABLE NO. VIII. — SEINE-FISHERY AT THE MOUTH OF THE MERRIMACK.

	Shad.	Alewives.
N. Lattime	7	140

SEVENTEENTH ANNUAL REPORT
OF THE
COMMISSIONERS
ON
INLAND FISHERIES,
FOR THE
YEAR ENDING DECEMBER 31, 1882.

BOSTON :
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Commonwealth of Massachusetts.

To His Excellency the Governor and the Honorable Council.

The Commissioners on Inland Fisheries beg leave to present their Seventeenth Annual Report.

FISHWAYS.

Fishways have been completed this season at Ipswich Mills, at Willowdale, and at the dam of C. J. Norwood. Ripley Bros. failed to comply with the requirements. Some arrangement will be made for putting in a fishway over this dam early in the spring, and this will open the Ipswich River its whole length.

The mill and dam at Middleborough having passed into the hands of Mr. Sherman, a fishway will be constructed at that place next year. Negotiations are pending for the construction of one at Swansea. The fishways throughout the State are generally in good working order, and answer the purpose for which they were constructed.

The following is the report of Mr. Holmes, Superintendent of Lawrence Fishway :

REPORT OF FISH SEEN IN THE LAWRENCE FISHWAY IN THE YEAR 1882.

April 22. Let water into fishway.

May 5. Saw the first fish ; a few alewives, suckers and chubs.

6. Alewives and suckers, run small.

7. Alewives, run small ; suckers and chubs, run large.

8. Alewives, suckers and chubs, run small.

9. Alewives, suckers and chubs, run small.

10. Alewives and lampers (" lamper eels "), run small ; suckers, run large.

11. Alewives, suckers and lampers, run small.

12. Alewives, suckers, chubs and lampers, run small.

13. Alewives, suckers and chubs, run small.

- May 14. Alewives, suckers and lampers, run small.
 15-27. The river high, muddy, and a very cold rain; very few fish running.
 29. Alewives, run moderate; lampers, run small.
 30 to } A big freshet in the river; water very muddy; very few fish
 June 7. } running.
 8. Alewives, suckers and lampers, run moderate.
 9. Alewives, suckers and lampers, run moderate.
 10. Alewives, run large; lampers, run small.
 11. Alewives, suckers and lampers, run moderate; one silver eel; a few red-fin shiners.
 12. One *shad*; alewives and suckers, run large; lampers, run small.
 13. Alewives and suckers, run large; lampers, run moderate; one silver eel; two black bass.
 14. Alewives, suckers and lampers, run large; one silver eel; one black bass; a few red-fin shiners.
 15. Alewives and suckers, run large; lampers, run small.
 16. Alewives, run large; lampers, run small; one black bass; *one salmon*, 15 pounds.
 17. Alewives and suckers, run moderate; lampers, run small; a few small silver eels.
 18. Alewives and suckers, run moderate; lampers, run small.
 19. Alewives and suckers, run small.
 20. Alewives and suckers, run small; one black bass; *one salmon*, 10 pounds.
 21. Suckers, run small; *one salmon*, 10 pounds; river high.
 22. Alewives and suckers, run moderate; lampers, run small; one silver eel.
 23. Alewives and suckers, run moderate; one black bass.
 24. Alewives and suckers, run small; one *shad*.
 25. Suckers, lampers and silver eels, run small.
 26. Suckers and silver eels, run small; *four salmon*, 10 to 15 pounds.
 27. *Four salmon*, 10 to 15 pounds.
 28. Suckers and silver eels, run very small; one black bass.
 29. Suckers and silver eels, run small.
 30. One black bass; *two salmon*, 8 to 12 pounds; suckers and silver eels, run small.
 July 1. Suckers, chubs and silver eels, run small.
 2. Suckers, chubs and silver eels, run small; one black bass.
 3. Suckers, chubs and lampers, run small.
 4. Suckers, chubs and small silver eels, run small.
 5. Suckers, chubs and silver eels, run small.
 6. Suckers and chubs, run small; one black bass.
 7. Suckers, chubs and silver eels, run small.
 8. Suckers, chubs and silver eels, run small.
 9. Suckers, chubs and silver eels, run small; a few small roach; one black bass; *one salmon*, 12 pounds.

- July 10. Suckers, chubs and silver eels, run small; *two salmon*.
 11. Suckers, chubs and silver eels, run small; *three salmon*.
 12. Suckers, chubs and roach, run small; four black bass.
 13. Suckers, chubs silver eels, and roach, run small.
 14. Suckers, chubs and silver eels, run small; two black bass.
 15. Suckers, chubs and silver eels, run small.
 15. Suckers, chubs and silver eels, run small; three black bass.
 17. Suckers, chubs and silver eels, run small.
 18. Suckers, chubs and silver eels, run small.
 19. Suckers, chubs and silver eels, run small; two black bass.
 20. Suckers, chubs and silver eels, run small.
 21. Suckers, chubs and silver eels, run small.
 22. Suckers, chubs and silver eels, run small; three black bass.
 23. Suckers, chubs and silver eels, run small; four black bass.
 24. Suckers, chubs and silver eels, run small.
 25. Suckers, chubs and silver eels, run small.
 26. Suckers, chubs and silver eels, run small; two black bass.
 27. Suckers, chubs and silver eels, run small. Shut water out of fishway; river very low.

Water shut out of the fishway the rest of July and August, excepting Sundays, on account of low water. When water was shut out of fishway only a few suckers, chubs and silver eels in it. Water shut out in September, excepting Sundays, until the 16th, when it was let in in the afternoon.

- Sept. 17. Suckers and chubs, run small; *one salmon*, 8 pounds.
 18. *Three salmon*, 8 to 15 pounds.
 19. Suckers, chubs and silver eels, run small.
 20. Suckers and silver eels, run small. Shut water out of fishway; river low.
 23. Let water into fishway at night.
 24. Suckers and chubs, run small; *one salmon*, 10 pounds.
 From September 25 to September 28 a freshet in the river; water very turbid; did not draw the fishway off.
 29. A few suckers and chubs; *one salmon*, 10 pounds.
 30. A few suckers and silver eels.

From October 1 to November 1 saw nothing but suckers, chubs and silver eels in fishway. The run of suckers and chubs was quite large for about two weeks, then it was less and less, until I shut the water out (November 1), when there was no fish.

THOS. S. HOLMES,
Superintendent Lawrence Fishway.

LAND-LOCKED SALMON.

Massachusetts' share of land-locked salmon spawn for 1882 was 107,500; to this were added 5,000 given by the U. S. Commission. They were hatched with a loss of 4,300 eggs, giving something over 108,000 healthy young fish, which were distributed as follows:—

	CANS.
E. B. Owen, for ponds in Stockbridge,	4
E. B. Stoddard, for ponds in Worcester,	4
Thos. Lawrence, for ponds in Falmouth,	2
A. Phinney, for ponds in Falmouth,	4
A. J. Hubbell, for ponds in Gt. Barrington,	4
Sydney Strong, for ponds in Northampton,	4
W. A. Bullard, for ponds in Wayland,	2
J. H. Curtis, for ponds in Scituate,	2
W. H. Savage, for ponds in Harvard,	3
J. F. Wight, for ponds in —,	1

There was scarcely any loss in transportation. Some complaints have been expressed in regard to the distribution of land-locked salmon and trout from the fact that the demand was greater than the supply. This will probably be, at least in part, obviated by an increased supply of these fish for distribution for the spring of 1883.

Parties desiring young fish will lessen the labors of the Commissioners by sending early applications.

TROUT. (*Salmo fontinalis*).

There were hatched from last year's spawn about 47,000 brook trout, which were distributed as follows:—

	CANS.
C. W. Forbes, Sheffield,	1
W. H. Foote, Westfield,	4
Gordon C. Rowley, Blandford, }	
E. M. Sewell, Medfield,	1
J. F. Wight, Boston,	1
Henry Goulding, Natick,	1
W. Hapgood, Boston,	2
O. C. White, Hopkinton,	1
John Cummings, Woburn,	2
Thos. Talbot, North Billerica,	2

It will be seen by Superintendent Hodge's report that there will probably be an increase of brook trout for next spring, and that extensive preparations have been made for a large supply in the future, not only of these fish, but also of the California or rainbow trout, a remarkably hardy fish, suited to warmer water than the common brook trout, and growing much more rapidly. It is said that the introduction of the California trout has succeeded well in New York State.

In addition to these there will be, for distribution next April or May, from eighty to ninety thousand Lake Superior or salmon trout. These should be placed in the largest and deepest ponds in the State. They are not suited for streams and shallow water.

HATCHING SHAD ON THE MERRIMACK.

In the report of last year it was stated that by hatching shad at North Andover, and carrying the young fish well up the river, the breeding-grounds might be extended, giving a large increase in addition to the artificial propagation. The statement in regard to the increase of the breeding-grounds is based upon the fact, that, of the few shad known to have reached the Lawrence dam since the new fishway was constructed, some, and probably all, have gone freely over it. That there is no impediment to the easy passage of all kinds of fish over this dam, is well known to all who have paid the subject any attention.

In accordance with this statement, arrangements were made for restocking the river; but, owing to unexpected delays, the work was not commenced till the spawning season was partially over. This greatly lessened the amount of spawn which otherwise might have been secured. The taking and hatching of spawn was carried on at North Andover, the only place on the river where ripe shad can be obtained. The work was done by Holmes and Chadwick, under the immediate inspection of the Commission. Owing to the unavoidable delay, the scarcity of fish, and a sudden rise of temperature of the river, the number of young shad obtained fell short of what was expected.

DETAILED REPORT OF HOLMES AND CHADWICK.

To the Commissioners on Inland Fisheries.

GENTLEMEN: — We herewith submit the following report, giving the full details of this year's experience in hatching shad at North Andover. The hatchery was opened June 12th, and closed July 20th.

Number of shad taken,	654
“ shad sold,	55
“ shad returned to river alive,	268
shad given away,	331
“ males,	334
“ females,	320
“ striped bass taken,	2
“ salmon taken,	29
“ “ returned to river alive,	26
“ “ taken dead,	3

The estimated amount of shad spawn taken was 1,227,000. From this amount about 1,000,000 fish were hatched. Of this number, 150,000 were delivered to the Fish Commissioners of New Hampshire, to be turned into the river above Concord, N. H.; 40,000 were turned into the river four miles above the Lawrence dam. The balance, nearly 800,000, were turned into the river at the hatching station at North Andover. A large portion of the 331 shad given away were distributed to laboring men with families, mostly mill operatives.

It is evident that the largest percentage of the spawn may be expected to hatch when the temperature of the water is from 70° to 74°. When the temperature of the water rose to 76°, it was found necessary to cover the hatching-boxes with cloth to protect the spawn from the direct rays of the sun. Thus protected there is but little difficulty in hatching the spawn until the temperature of the water rises above 80°. The following table will show the number of shad taken each day, the proportion of males to females, the temperature of the water and air, also the time of drawing the seine, the number of fish taken at each sweep, and the estimated amount of spawn taken.

	Shad taken.	Males.	Females.	Temperature of Water at 7 p.m.	Temperature of Air at 7 p. m.	Time of haul- ing seine.	Fish per sweep.	Estimated amount of spawn taken.
June 12, .	28	20	8	65°	62°	7, 8, p.m.	11, 17	18,000
" 13, .	15	10	5	66	60	7 ¹ / ₂ , 9, "	8, 7	12,000
" 14, .	36	22	14	68	65	7 ¹ / ₂ , 8, 9, "	9, 13, 14	10,000
" 15, .	11	7	4	70	64	7, 8, 9, "	3, 4, 4	18,000
" 16, .	37	24	13	71	67	7, 8 ¹ / ₂ , 9 ¹ / ₂ , "	21, 9, 7	20,000
" 17, .	25	15	10	69	65	6 ¹ / ₂ , 7 ¹ / ₂ , 8 ¹ / ₂ , "	11, 3, 11	30,000
" 19, .	26	14	12	71	65	6 ¹ / ₂ , 7 ¹ / ₂ , 9, "	8, 10, 8	30,000
" 20, .	36	22	14	72	61	6 ¹ / ₂ , 7 ¹ / ₂ , 8 ¹ / ₂ , "	8, 12, 16	40,000
" 21, .	23	12	11	70	62	7, 8, 9, "	4, 10, 9	55,000
" 22, .	24	13	11	70	66	2, 3, 6, 7, 8, "	2, 6, 9, 4, 3	,000
" 23, .	10	5	5	70	68	7, 8, 9, "	1, 6, 3	4,000
" 24, .	15	6	9	73	76	7, 8, 9, 11, "	1, 10, 4, 0	60,000
" 26, .	44	19	25	74	68	7, 8, 10, "	4, 24, 16	200,000
" 27, .	35	14	21	74	63	7 ¹ / ₂ , 9, "	9, 26	200,000
" 28, .	26	10	16	77	68	7, 8, 9 ¹ / ₂ , "	7, 10, 9	50,000
" 29, .	28	12	16	76	63	7, 8, 9, "	6, 10, 12	60,000
" 30, .	32	9	13	75	62	7 ¹ / ₂ , 8, 9 ¹ / ₂ , "	8, 4, 10	30,000
July 1, .	20	9	11	72	59	7, 8, 9, p.m.	3, 6, 11	30,000
" 3, .	21	14	7	70	62	6 ¹ / ₂ , 7 ¹ / ₂ , 9, "	6, 8, 7	12,000
" 5, .	9	5	4	68	59	7, 8, 9 ¹ / ₂ , "	0, 3, 6	12,000
" 6, .	17	10	7	68	62	7, 8, 9, "	6, 4, 7	,000
" 7, .	32	17	15	69	63	7 ¹ / ₂ , 8, 9, "	4, 20, 8	80,000
" 8, .	21	10	11	72	68	8, 9, 10, "	6, 8, 7	30,000
" 10, .	19	6	13	76	74	7, 8, 9, "	8, 4, 7	20,000
" 11, .	14	5	9	79	76	8, 9, "	6, 8	50,000
" 12, .	13	5	8	79	74	7, 8, 9, "	0, 6, 7	20,000
" 13, .	15	6	9	79	74	7 ¹ / ₂ , 9, "	12, 3	80,000
" 14, .	12	4	8	79	73	8, 9, 10, "	8, 1, 3	30,000
" 15, .	6	2	4	80	72	7, 8, 9, "	3, 0, 3	8,000
" 17, .	7	3	4	80	71	7, 8, 10, "	1, 2, 4	18,000
" 18, .	4	3	1	80	70	7, 8, 9, "	3, 0, 1	,000
" 19, .	3	1	2	80	73	8, 9, "	2, 1	,000

The results of the artificial hatching of shad this season have been very encouraging, but a much greater number of fish should be annually hatched at this station in order to increase the run of fish in years to come. This station when put in good running order will produce 3,000,000 shad in the period of forty days from the first day of June. To persons not acquainted with fish-culture this may seem to be a large number; and yet it is small, comparatively, when we consider that previous to the obstructions to migratory fish, made by the construction of numerous dams on the river, the annual deposit of shad spawn along the headwaters of the Merrimack was probably more than twenty millions. Should the business be continued another season, it will be economy for the State to own a new seine made expressly for this station. The mesh should be two and a half inches, thus avoiding the killing of fish in hauling. A simple log boom is not sufficient to properly protect the hatching-boxes from the large amount of filth floating in the river. A movable boom, thirty feet long and ten inches deep, made of planks at a proper angle, sloping in both directions and safely anchored with chains, could be constructed at an expense not exceeding ten dollars, and this would greatly lessen

the amount of labor in the care of the hatching-boxes. Better accommodations are also needed for the fishermen.

Yours respectfully,

B. P. CHADWICK,
ROBERT R. HOLMES.

From information obtained from time to time it appeared evident that the depletion of the Merrimack River was largely due to other causes than the legitimate fishing. It was decided that a thorough investigation should be made. For this purpose Mr. B. P. Chadwick was appointed. He was indorsed by the Chief of the State Detective Force as a suitable man for the purpose. His report was severely criticised by the Newburyport fishermen. The Commissioners, however, believe that Mr. Chadwick was loyal to the State, and that he faithfully discharged the duties assigned him. Finding that his report had created a strong opposition, Mr. Chadwick tendered his resignation. On the recommendation of several of the leading citizens of Newburyport, Edwin F. Hunt was selected to make further investigations at the mouth of the river. Mr. Hunt is a citizen of Newburyport, has been a fisherman, and is familiar with the fisheries of the Merrimack. The report of Mr. Hunt, which is here appended, is more conservative than that of Mr. Chadwick, yet in regard to the important question of the destruction of the young fish, it does not materially differ, and is corroborated by statements which have been received during the past three years.

REPORT OF THE FISHERIES ON THE LOWER MERRIMACK.

To the Commissioners on Inland Fisheries.

GENTLEMEN,—I beg leave to present the following report for the year ending Nov. 3d, 1882.

There have been eight (8) seines used more or less on the lower part of the Merrimack during the past season, as follows,—five (5) at Newburyport, one (1) at Amesbury, one (1) at Groveland, and one (1) at Haverhill. Those at Newburyport are owned and run more or less as follows: Hiram Janvrin, Benjamin Stevens, Lewis Atwood, Samuel Furlong, George Thurlow and Henry Short. The seine of Nicholas Lattimer, with Andrew Hall as assistant, has been used occasionally.

Mr. Lattimer uses his small seine for catching bait for his eel-pots, also for smelts and yellow eels that will not be induced to enter the black-eel pots. Besides the above-named fishermen, the following persons usually engaged in clamming, use seines occasionally, —Daniel Nutting, John Hoyt, John Bryant, Charles Ryan, Lewis Short, Joseph Furlong, John Black, Clinton Lattimer, D. Coullard, Augustus Pike, Eliphalet Pike, Henry Sayward. The three seines used by these were owned by William Perkins, John Janvrin and Eliphalet Pike. Mr. Pike, the last named owner, after being duly warned not to break the law, persisted in fishing during the closed season in June, and, in consequence, he was proceeded against, fined by the court twenty-five dollars (\$25) with costs of court, and confiscation of nets and boats.

For the second season no menhaden have appeared at the mouth of the river. As a consequence the fishermen have depended upon alewives, bluebacks, and such other small fish as could be caught for bait. Many vessels in search of bait, which would have entered the river had the menhaden been plenty, were obliged to go elsewhere.

The number of shad taken during the allowed time of fishing in May was small, the season being unusually late. June 23d a considerable number of shad were taken, but mostly returned to the river, according to law. July 6th the first outside vessels came for bait. There were during the season, furnished to vessels engaged in fishing, about seventeen hundred barrels of bait at \$1.25 per barrel.

For several seasons past there have been some parties here from New York State fishing for sturgeon. They arrived this year July 11th, and stopped about four weeks, catching only three sturgeon. So far as I have been able to learn no other persons have fished for sturgeon on the river. Soon after the burning of the Pacific Mills at Lawrence, when a large amount of dyestuffs and other chemicals flowed into the river, report came to me that a large number of dead salmon were to be found on the shores of the river. I made a careful inspection of both banks, and found one dead salmon below Essex Merrimack bridge, and six between Lawrence and Haverhill. I am confident that this is the extent of the injury done to the fish, although reports multiplied them into hundreds.

There was considerable unpleasant feeling manifested toward me in discharging my duty, which was entirely unnecessary and uncalled for. If the fishermen intended to abide by the law which they themselves agreed to, there would have been no occasion for complaint or ill-feeling on their part. On the whole I think they have done better than was expected. I have been a fisherman myself and know something of the temptation that surrounds them. Again, it is not easy to break old habits. Many of them do not stop to reflect upon the result of what they are doing, and think it hard that they should not be allowed to do just what they please without any interference.

Your attention has been called to the fact that seines with meshes of one-quarter to one half-inch are used in the fall when the young shad and alewives descend the river. I forward to you a sample of young

fish taken from one of these seines, for inspection. It is very evident that the use of these seines is a serious injury to the fisheries of the Merrimack, and in justice to all should be discontinued.

Yours truly,

EDWIN F. HUNT.

It is desirable that hatching and planting of shad should be prosecuted vigorously, and that every obstacle in the way of restocking the river should be removed. The attention of the legislature is called to the fact that there are several seines used at Newburyport with a mesh of from a quarter to half an inch. These nets are run through the fall months, at the time the young shad and alewives are descending the river, and are used for the purpose of taking all kinds of small fish. This is not only unjust to all the fishermen, but cannot fail to be a serious drawback in restocking the river, or even in maintaining it in its present condition. We recommend that no seine be allowed on the lower part of the Merrimack with a mesh less than two and one-half inches, or what is known as the alewife mesh. This would in no way interfere with the taking of menhaden and alewives, or what the fishermen call bluebacks, for bait, while it would prevent the wholesale destruction of young fish.

SALMON (*Salmo salar*).

In the spring of 1871 your Commissioners, united with several of the New England States for the purpose of procuring salmon spawn, under the superintendence of Charles G. Atkins, Commissioner of Maine. His plan was to buy live salmon from the fishermen at the mouth of the Penobscot River, and transport them to a small pond where they would be under control until ready to spawn. By this arrangement the cost of salmon spawn was reduced from forty (40) dollars per thousand, the price charged in Canada, to less than three (3) dollars. Soon after the commencement of this work Prof. Baird, United States Commissioner, joined the association, tendering the aid of the National Government. This arrangement continued until 1876, when Prof. Baird, under the impression that salmon spawn could be obtained from California at much less expense, withdrew from the Bucksport establishment.

As the funds of the New England Commissioners did not warrant the continuation of the work alone, it was for a time abandoned. Prof. Baird's conclusion as to the cost of California spawn was correct; but unfortunately the California salmon (*Salmo quinnat*), after a fair trial, proved to be an entire failure in New England waters. This was a disappointment, causing a break of four years in the work of establishing salmon in the Merrimack, as well as elsewhere. The success of the Penobscot salmon in the Merrimack has led to the re-opening of the works near Bucksport, with the co-operation of the United States Commission. By means of the contributions from several of the New England States, together with the assistance of the National Government during the past three years, the hatching works near Bucksport have been sending out a large supply of excellent salmon spawn. As it takes four years from the time they are hatched for salmon to return as spawning fish, the break above alluded to was more or less felt during the past season; but, notwithstanding this, more salmon have been taken this year at the Plymouth Works than at any season since they commenced returning to the river. During the last two years about eight hundred thousand young fish have been turned into the Pem'gewasset River above Livermore Falls. The consequence is that the river has swarmed with smolts, or young fish, during the past season. The return of these fish in 1885 and 1886 ought to furnish the works at Plymouth with a large amount of salmon spawn. This would obviate the necessity of going elsewhere for a supply.

Thirty-six thousand young salmon were turned into the Nashua River.

Salmon Spawn hatched, and Young Fish put into the Headwaters of the Merrimack in 1882.

Spawn from Bucksport,	341,000
Loss of eggs and fish,	6,698
Put into the river,	334,302
Salmon spawn taken at Plymouth, N.H.,	125,000
Loss of eggs and fish,	4,319
Total number of young salmon turned into the river for the spring of 1882	454,983

REPORT OF E. B. HODGE, SUPERINTENDENT OF THE WORKS AT PLYMOUTH, N.H., UNDER THE JOINT ACTION OF MASSACHUSETTS AND NEW HAMPSHIRE.

To the Commissioners on Inland Fisheries for the Commonwealth of Massachusetts.

When I assumed charge of the joint hatching-house near Livermore Falls, June 1, the work of hatching for the year had been completed, and the salmon fry had been placed in the Pemigewasset. I immediately had the reservoir put in condition to receive the expected spring run of salmon.

The nets were placed in the river the 20th of June, and the first salmon taken the 26th. Owing to another unusually dry season following the severe drought of last year, the water, by the 20th of July, became too low for the fish to run. The fall run began about the last of September, and the last salmon was taken November 3. Thirty-three were taken in all — an increase of about twenty-five per cent.

The eggs were taken the last week in October, and are remarkably healthy, the loss so far being only a fraction of one per cent.; 150,000 brook-trout eggs are now in the hatching-house, 75,000 of which I shall forward to you as soon as they are sufficiently advanced.

The unusual low water in the Pemigewasset the last two years is not owing, as many suppose, to cutting away of the forests, causing the springs to dry up, and thus diminishing the volume of water in the river, but to the unusual light rain-fall, — as the area of woodland in Grafton County, and I might say in the whole State, is larger than twenty-five years ago. As directed, I have added about 500 brook-trout this season to the stock already in the ponds, making now about 600 two years old and upwards, and 500 from one to two years old.

There are also in the large pond from two to four thousand fry of the "California" or rainbow trout. Many of them are four inches and over in length, which shows a rapid growth, as they are only six months old. It will be necessary to prepare a place for them another season.

The young salmon in the river this year were unusually plenty, more so than any previous year. So numerous were they on the rapids below the falls that it was impracticable to fish for trout, as a parr or smolt would be hooked at almost every cast.

Many of the salmon that passed the fishways did not reach here, owing to the low water. They were plenty between here and Bristol in the pools, and some are reported to have fallen victims to the spear of the poacher.

It is to be hoped that some action will be taken the coming season to prevent such violation of the law.

Over 900 feet of gravelled walk has been made around the ponds. As the supply of water in the hatching-house was not sufficient for the young fish when all the trays were full, I have laid a two-inch pipe from the large spring south of the house, which gives an additional supply of over 16,000 gallons per day. This water is three degrees colder than that from the old spring, and will retard the hatching, which

will be an advantage, as the young fish will not be ready to place in the streams until they are free from ice and have become warm enough to furnish food for the young fry.

The fact that no increase in the run of salmon was expected this year, together with the unusually large number of young fish in the river, certainly gives great encouragement for the success of the enterprise in the future.

E. B. HODGE, *Superintendent.*

PLYMOUTH, N. H., Dec. 4, 1882.

CULTIVATION OF CARP.

In the fall of 1880 the Massachusetts Commissioners sent to Washington and procured from Prof. Baird five hundred German carp. Soon after eight hundred more were received from Prof. Baird, together with a list of about forty applicants from various parts of New England. These fish were distributed as stated in the report of 1880. The carp were very small, being only two or three inches long, and the number distributed not exceeding a dozen to each person. In all cases the applicants were informed that the carp were vegetable feeders, and utterly defenceless against other fish, and that frogs and water-snakes were very destructive to them. But little attention appears to have been paid to these statements. In many cases the young carp were dumped into ponds containing perch, pickerel, and other voracious fish, or into sloughs among pouts, frogs and mud-turtles, where no protection could be given them. Under such circumstances it is not to be wondered at that but little has been heard from them, and that most of the parties took their last look at them when they turned them into the water, or that the impression has gone out that they are not suited to the waters of New England. This impression has been strengthened by statements of the success and wonderful growth of the carp in the Southern States.

Under the treatment they received it was a mistake to have distributed them in such small numbers. Had each applicant received one or two hundred the result might have been more satisfactory.

The carp is essentially a farmer's fish, easily raised, and requiring no great amount of skill to obtain them in abundance. In some places in Austria and Bohemia the

land is alternately used for raising crops and carp; first the land for a few years is used for agricultural purposes, then flowed and stocked with carp.

Four of the five hundred carp received by the Commissioners were placed in the reservoir at the Tewksbury Almshouse. There were several reasons for putting them in that place. First, they were received too late in the season to prepare a pond for them; secondly, it gave a chance of testing them without expense to the State. The water is cold spring-water, pumped from what used to be a trout stream. They have lived and grown finely, many of them weighing from one and a half to two and a half pounds. The bottom of the reservoir is paved with stones. This, with the low temperature of the water, prevents vegetable growth, and consequently renders it an unfavorable place for carp. With a grassy bottom and higher temperature they would probably have doubled their size. This shows a rapid growth under adverse circumstances. They have been under the care of Mr. T. J. Marsh, Jr., assistant superintendent, who has fed them with stale bread from the almshouse. Many of the fish are large enough to spawn next summer. Should the appropriation warrant it, breeding ponds will be constructed in the spring, and every effort made to multiply and distribute them in large numbers. Applications are on file from almost every town in the State, asking for a supply of these fish. They are especially valuable to the inland towns where fish are scarce, and where they can be grown for a less price than any other food.

Carp ponds should be flowed loam or grass land, the deepest part running through the centre, sloping to the outlet, where it need not be over five or six feet deep. The rest of the pond should be shallow. This would enable the cultivator to control the water, and by drawing it off slowly bring all his fish into a small compass. Very little more water is needed than will supply the evaporation. When streams are dammed for the purpose of making ponds, the overflow may be taken around the pond and the supply from an inlet at the upper end or side. The fish may be fed on all kinds of vegetables. Where the pond is large they will obtain a large part of their food from the pond. It is a

question of pasturage and feed as to the number kept in a pond of a given size. As their food is inexpensive, being easily obtained on any farm, the keeping of large numbers in a small place may be often desirable. Water-snakes, frogs, and every kind of fish that preys upon other fish should be kept out of the breeding pond, or any other place where the young carp are kept. According to the statement of R. O. Sweeney, Commissioner of Minnesota, the carp have thriven in the ponds connected with the hatchery of that State.

Mr. Sweeney says that he received 300 carp some time ago from Prof. Baird, but upon his advice had kept them in the hatchery for breeding purposes. There they had grown well and had bred well, but the Commissioners did not know to what extent, as they did not wish to disturb them in the pond, and to find out just what the result was would necessitate the drawing off of the pond or the use of nets, as the fish would not bite. He believes that within a short time there will be plenty of carp at the hatchery to distribute throughout the State.

CONCLUSION.

In the economy of living, next to meat comes fish, the importance of which has been recognized through all time, for in addition to its nutritious character it enables us to vary our food, an essential to good health, and, until within a few years, has had the additional merit of being the cheapest of food, coming within the reach of the humblest laborer.

Had this state of things continued it is possible that but little would have been done in fish-culture. The increase in population, together with the facilities for rapid transportation, have increased the demand beyond the supply, and prices have advanced until fresh fish, before it reaches the consumer, costs more than bread,

The possibility of fish becoming one of the *luxuries* instead of one of the *necessaries* of life has created a public sentiment throughout the civilized world, demanding that fish-culture should receive its full share of attention. It was *this* that forced the National Government to create a Commission to investigate and improve the fisheries, and caused *thirty-five* States and Territories to appoint Commis-

sioners, backed in many cases by large sums of money, for the purpose of devising the best means of restocking our rivers and streams to their former abundance.

Considering the short time which has elapsed since the commencement of the work, and that many if not all of the Commissioners had, at times, to grope their way in the dark, the results obtained are remarkable.

Massachusetts was the first to lead in this work, with, probably, more obstacles to overcome than any other State. Her migratory fish had all been destroyed or so reduced as to be of little value; a result which many persons supposed was not so much due to overfishing as to blocking the rivers and streams by insurmountable dams, preventing the return of the fish to their spawning grounds.

The vast wealth invested in the manufactories, the motive power of which was derived from these dams, was naturally arrayed against any efforts to restock the rivers. It was therefore no inconsiderable part of the work of the Commissioners, to harmonize as far as possible the public rights in the fisheries and the private interests of the manufacturers.

The invention of the fishway now in use in this State, as well as in some others, taking, as it does, so little water and that at a time when there is generally a surplus, did much toward removing any misapprehensions of the owners or occupants of the dams, and it is due them to say that, with very few exceptions, they have willingly complied with the demands made upon them.

Successful as has been the work of the Commissioners throughout the several States, little has been done compared with what might have been, and doubtless *will be*, when the people more thoroughly see its importance and acquire the judgment and skill necessary to complete success. Fish-culture, like every other industry, is a matter of growth. It has taken many years to bring our manufactories up to their present standard. No public enterprise can be forced much above the general intelligence of the community, and fish-culture is no exception to the rule. So long as a State allows the destruction of the young fish distributed for the purpose of restocking its waters, or a few rapacious fishermen are

permitted to overrule the public good, so long will the work be more or less retarded.

With our one hundred and ninety-six thousand three hundred and forty acres of land covered with water, it will be seen that few States possess the advantages of Massachusetts for fish-culture.

This large area of water does not include the small streams that everywhere thread our meadows and lowlands, which might be turned into carp ponds, yielding a far better return than any other part of the farm.

The Hon. Theodore Lyman, who has faithfully served as a Commissioner without compensation since the establishment of the Commission, over seventeen years ago, has retired from the board during the present year. His colleagues on the Commission desire to place upon record their high appreciation of his labors in the cause of fish-culture, and their recognition of the cordial relations which have always existed between them. For what has been accomplished in restocking our ponds and rivers, and in arousing public interest in the work, the Commonwealth is largely indebted to him; while his influence has always been given to secure the rights of the people.

Respectfully submitted,

E. A. BRACKETT,
ASA FRENCH,
F. W. PUTNAM,

Commissioners.

EXPENSES OF COMMISSION.

Salary,	\$1,650 00
Travelling and other expenses,	132 60
Paid to Priscilla Freeman (Res. 1882, Chap. 55),	500 00
Subscription to fund of Schoodic Salmon-breeding Establishment,	500 00
Subscription to fund of Penobscot Salmon-breeding Establishment,	500 00

GENERAL EXPENSES.

Hatching-house at Plymouth:—

A. H. Powers, services,	\$150 00	
Rent of hatching-house,	25 00	
Rent of land and streams,	25 00	
Labor,	31 25	
Expressage,	28 36	
Miscellaneous expenses,	24 53	
		\$284 14
Rent of land for hatching-house at Winchester,	50 00	
George E. Atkinson, care of Holyoke Fishway,	75 00	
Edwin F. Hunt, services and expenses,	524 27	
E. B. Hodge, services and expenses,	227 56	
Essex Company, privilege of fishing in Merrimack River,	30 00	
Morris Knowles, labor and materials at Lawrence,	82 90	
Chase Philbrick, services, Merrimack River,	49 50	
James Smith, services, Merrimack River,	10 00	
John A. Loring, use of premises, boats and nets at Andover,	50 00	
Thos. H. Pinkham, services of assistant,	51 00	
F. D. Brackett, services and expenses,	24 10	
W. H. Foote, expenses,	3 05	
Printing,	168 26	
Postage, telegrams and expressage,	30 58	
Cases and boxes,	10 70	
Rubber boots,	4 50	
Fish screens,	20 10	
Gate and lock at Holyoke Fishway,	4 85	
		<hr/> \$4,983 11

APPENDIX.

[A.]

LIST OF FISH COMMISSIONERS.

DOMINION OF CANADA.

W. F. Witcher, Commissioner, Ottawa, Ontario.

PROVINCE OF NEW BRUNSWICK.

W. H. Venning, Inspector of Fisheries, St. John.

PROVINCE OF NOVA SCOTIA.

W. H. Rogers, Inspector, Amherst.

PROVINCE OF PRINCE EDWARD ISLAND.

J. H. Duvar, Inspector, Alberton.

PROVINCE OF BRITISH COLUMBIA.

A. C. Anderson, Victoria.

THE UNITED STATES.

Prof. Spencer F. Baird, Washington, D.C.

ALABAMA.

C. S. G. Doster, Prattville.

D. B. Huntley, Courtland.

ARIZONA.

John J. Gosper, Prescott.

Richard Rule, Tombstone.

Dr. J. H. Taggart, Business Manager, Yuma.

ARKANSAS.

John E. Reardon, Little Rock.

James H. Hornibrook, Little Rock.

H. H. Rottaken, Little Rock.

CALIFORNIA.

S. R. Throckmorton,	San Francisco.
J. D. Farwell,	Niles, Alameda Co.
W. W. Traylor,	San Francisco.

COLORADO.

Wilson E. Sisty,	Idaho Springs.
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CONNECTICUT.

Dr. Wm. M. Hudson,	Hartford.
Robert G. Pike,	Middletown.
George N. Woodruff,	Sherman.

DELAWARE.

Enoch Moore, Jr.,	Wilmington.
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GEORGIA.

J. T. Henderson, Commissioner of Agriculture, and <i>ex officio</i> Commissioner of Fish and Fisheries,	Atlanta.
Dr. H. H. Cary, Supt.,	La Grange.

ILLINOIS.

N. K. Fairbank, President,	Chicago.
S. P. Bartlett,	Quincy.
S. P. McDoel,	Aurora.

INDIANA.

Calvin Fletcher,	Spencer, Owen County.
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IOWA.

B. F. Shaw,	Anamosa.
A. A. Mosher, Assistant,	Spirit Lake.

KANSAS.

Hon. D. B. Long,	Ellsworth.
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KENTUCKY.

William Griffith, President,	Louisville.
Hon. John A. Steele,	Versailles.
Dr. Wm. Van Antwerp,	Mount Sterling.
A. H. Goble,	Catlettsburg.
Hon. C. J. Walton,	Munfordville.
Dr. S. W. Coombs,	Bowling Green.
John B. Walker,	Madisonville.
P. H. Darby,	Princeton.
Hon. J. M. Chambers,	Independence, Kenton Co.
W. C. Price,	Danville.

MAINE.

E. M. Stilwell,	Bangor.
Henry O. Stanley,	Dixfield.

MARYLAND.

Thomas Hughlett,	Easton.
G. W. Delawder,	Oakland.

MASSACHUSETTS.

E. A. Brackett,	Winchester.
Asa French,	South Braintree.
F. W. Putnam,	Cambridge.

MICHIGAN.

Eli R. Miller,	Richland.
A. J. Kellogg,	Detroit.
Dr. J. C. Parker,	Grand Rapids.

MINNESOTA.

1st District — Daniel Cameron,	La Crescent.
2d District — Dr. Wm M. Sweney,	Red Wing.
3d District — Dr. Robert Ormsby Sweeny,	St. Paul.
4th District — No appointment until January.	
5th District — No appointment until January.	

MISSOURI.

Dr. J. G. W. Steedman, Chairman,	2803 Pine Street, St. Louis
John Reid,	Lexington, Lafayette County
Dr. J. S. Logan,	St. Joseph.

NEBRASKA.

W. L. May,	Fremont.
R. R. Livingston,	Plattsmouth.
B. E. B. Kennedy,	Omaha.

NEVADA.

Hon. Hubb G. Parker,	Carson City.
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NEW HAMPSHIRE.

George W. Riddle,	Manchester.
Luther Hayes,	Milton.
Albina H. Powers,	Grantham.

NEW JERSEY.

Dr. Benjamin P. Howell,	Woodbury.
Major Edward J. Anderson,	Trenton.
Theodore Morford,	Newton.

NEW YORK.

Hon R. Barnwell Roosevelt,	. . . . .	76 Chambers St., New York.
Edward M Smith,	. . . . .	Rochester.
Richard U. Sherman,	. . . . .	New Hartford, Oneida Co.
Eugene G. Blackford (Fulton Market, New York City),	809 Bedford Avenue, Brooklyn.

NORTH CAROLINA.

S. G. Worth,	Raleigh.
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OHIO.

Col. L. A. Harris, President,	Cincinnati.
Charles W. Bond, Treasurer,	Toledo.
Halsey C. Post, Secretary,	. . . . .	Sandusky.

PENNSYLVANIA.

Hon. H. J. Reeder,	. . . . .	Easton.
Hon. B. L. Hewit,	. . . . .	Hollidaysburg.
James Duffy,	. . . . .	Marietta.
John Hummel,	. . . . .	Selingsgrove.
Robert Dalzell,	. . . . .	Pittsburgh.
G. M. Miller,	. . . . .	Wilkesbarre.

RHODE ISLAND.

Alfred A. Reed,	. . . . .	Providence.
Newton Dexter,	. . . . .	Providence.
John H. Barden,	. . . . .	Rockland.

SOUTH CAROLINA.

A. P. Butler, Commissioner of Agriculture, and <i>ex officio</i> of Fish and Fisheries,	. . . . .	Columbia.
C. J. Huske, Superintendent,	. . . . .	Columbia.

TENNESSEE.

W. W. McDowell,	. . . . .	Memphis.
H. H. Sneed,	Chattanooga.
Edward D. Hicks,	Nashville.

TEXAS.

R. R. Robertson,	Austin.
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UTAH.

No appointment since the death of Prof. J. L. Barfoot in April last.

VERMONT.

Hiram A. Cutting,	Lunenburg, Essex Co.
Herbert Brainerd,	St Albans.

VIRGINIA.

Col. M. McDonald,	Berryville.
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WEST VIRGINIA.

Henry B. Miller, President,	Wheeling.
C. S. White, Secretary,	Romney.
N. M. Lowry,	.	.	.	.	.	Hinton.

WISCONSIN.

The Governor, <i>ex officio</i>,	.	.	.	.	.	Madison.
Philo Dunning, President,	.	.	.	.	.	Madison.
C. L. Valentine, Secretary and Treasurer,	.	.	.	.	.	Janesville.
J. V. Jones,	.	.	.	.	.	Oshkosh.
John F. Antisdel,	.	.	.	.	.	Milwaukee.
Mark Douglas,	.	.	.	.	.	Melrose.
Christopher Hutchinson,	.	.	.	.	.	Beetown.

WYOMING TERRITORY.

Dr. M. C. Barkwell, Chairman and Superintendent,	.	.	.	.	.	Cheyenne.
Otto Gramm, Secretary,	.	.	.	.	.	Laramie.
Hon. N. L. Andrews,	.	.	.	.	.	Johnson County
Hon. E. W. Bennet,	.	.	.	.	.	Carbon County.
Hon. P. J. Downs,	.	.	.	.	.	Uinta County.
Hon. T. W. Quinn,	.	.	.	.	.	Sweetwater Co.

[B.]

LIST OF PONDS LEASED.

*By the Commissioners on Inland Fisheries, under Authority given by Chap. 384, Sect. 9, of the Acts of 1869.**

1870.

- Feb. 1. Waushakum Pond, in Framingham, to Sturtevant and others, 20 years
April 1. Mendon Pond, in Mendon, to Leonard T. Wilson and another, 20 years.
Sept. 12. Baptist Lake, in Newton, to J. F. C. Hyde and others, 20 years.
Oct. 15. Archer's Pond, in Wrentham, to William E. George, 15 years.

1871.

- Jan. 10. Nine-Mile Pond, in Wilbraham, to B. F. Bowles, 10 years.
30. Little Pond, in Falmouth, to F. H. Dimmick, 10 years.
April -. Spectacle, Triangle, and Peters ponds, in Sandwich, to G. L. Fessenden and another, 5 years.
17. Long Pond, in Falmouth, to Joshua S. Bowerman and three others, 20 years.
May 15. Pratt's Pond, in Upton, to D. W. Batcheller, 20 years.
18. Little Sandy Pond, in Plymouth, to William E. Perkins, 15 years.
Nov. 1. Punkapoag Pond, in Randolph and Canton, to Henry L. Pierce, 20 years.

1872.

- Jan. 1. Sandy Pond, Forest Lake, or Flint's Pond, in Lincoln, to James L. Chapin and others, 20 years.
July 20. Little Pond, in Braintree, to Eben Denton and others, 20 years.

1873.

- May 1. Meeting-house Pond, in Westminster, to inhabitants of Westminster, 15 years.

* We would remind lessees of ponds that they are required, by their leases, to use all reasonable efforts to stock their ponds, and keep accurate records of the same, and make returns of their doings to the Commissioners on the 1st of October, each year, of the number and species of fish which they have put in or removed from their ponds. Any failure to comply with these conditions is a breach of contract invalidating their lease. It is important that the State should know just what is being done; and, where there appears to be mismanagement or apparent failure, the Commissioners will visit the ponds, and ascertain, if possible, the cause.

1873.

- May 1. Great Pond, in Weymouth, to James L. Bates and others, 15 years.
- July 1. Little Sandy Pond, in Pembroke, to A. C. Brigham and others, 16 years.
- Sept. 1. Pontoosuc Lake, in Pittsfield and Lanesborough, to E. H. Kellogg and others, 15 years.
- Oct. 1. Farm Pond, in Sherborn, to inhabitants of Sherborn, 15 years.
1. Spot Pond, in Stoneham, to inhabitants of Stoneham, 15 years.
- Nov. 1. Lake Chaubunagungamong, or Big Pond, in Webster, to inhabitants of Webster, 5 years.
- Dec. 1. Lake Wauban, in Needham, to Hollis Hunnewell, 20 years.

1874.

- Mar. 1. Walden and White Ponds, in Concord, to inhabitants of Concord, 15 years.
2. Upper Naumkeag, in Ashburnham, to inhabitants of Ashburnham, 20 years.
- April 1. Elder's Pond, in Lakeville, to inhabitants of Lakeville, 15 years.
20. North and South Podunk Ponds, in Brookfield, to inhabitants of Brookfield, 15 years.
- May 1. Maquan Pond, in Hanson, to the inhabitants of Hanson, 15 years.
2. Brown's Pond, in Peabody, to John L. Shorey, 15 years.
16. Wickaboag Pond, in West Brookfield, to Lemuel Fullam, 15 years.
20. Unchechewalom and Massapog ponds, to the inhabitants of Lunenburg, 20 years.
- July 1. Hardy's Pond, in Waltham, to H. E. Priest and others, 15 years.
1. Hockomocko Pond, in Westborough, to L. N. Fairbanks and others, 15 years.
11. Mitchell's Pond, in Boxford, to R. M. Cross and others, 15 years.
11. Hazzard's Pond, in Russell, to N. D. Parks and others, 20 years.
- Oct. 1. East Waushacum Pond, in Sterling, to inhabitants of Sterling, 20 years.
20. Middleton Pond, in Middleton, to inhabitants of Middleton, 15 years.

1875.

- Jan. 1. White and Goose Ponds, in Chatham, to George W. Davis, 15 years.
- Mar. 1. Lake Pleasant, in Montague, to inhabitants of Montague, 10 years.
1. Hood's Pond, in Ipswich and Topsfield, to inhabitants of Topsfield, 15 years.

1875.

- April 1. Chauncey Pond, in Westborough, to inhabitants of Westborough, 15 years.
 3. West's Pond, in Bolton, to J. D. Huriburt and others, 15 years.
 15. Gates Pond, in Berlin, to E. H. Hartshorn and others, 15 years.
 24. Pleasant Pond, in Wenham, to inhabitants of Wenham, 15 years.
- May 1. Morse's Pond, in Needham, to Edmund M. Wood, 15 years.
 1. Great Pond, in North Andover, to Eben Sutton and others, 20 years.
 1. Chilmark Pond, in Chilmark, to J. Nickerson and others, agents, 20 years.
- July 1. Winter Pond and Wedge Pond, in Winchester, to inhabitants of Winchester, 15 years.
 1. Haggett's Pond, in Andover, to inhabitants of Andover, 20 years.
- Aug. 1. Oyster Pond, in Edgartown, to J. H. Smith and others, 20 years.
 7. West Waushacum Pond, in Sterling, to inhabitants of Sterling, 20 years.
 9. Mystic (Upper) Pond, in Winchester, Medford, and Arlington, to inhabitants of Winchester and Medford, 15 years.
- Oct. 1. Little Chauncey and Solomon ponds, in Northborough, to inhabitants of Northborough, 15 years.

1876.

- Feb. 1. Great Sandy Bottom Pond, in Pembroke, to Israel Thrasher and others, 15 years.
- Mar. 1. Dennis Pond, in Yarmouth, to inhabitants of Yarmouth, 15 years.
 1. Crystal Lake, in Wakefield, to Lyman H. Tasker and others, 15 years.
 20. Lower Naumkeag Pond, in Ashburnham, to inhabitants of Ashburnham, 18 years.
 28. Dennison Lake, in Winchendon, to inhabitants of Winchendon, 15 years.
 28. Phillipston Pond, in Phillipston, to inhabitants of Phillipston, 20 years.
- May 8. South-west Pond, in Athol, to Adin H. Smith and others, 15 years.
- June 1. Norwich Pond, in Huntington, to inhabitants of Huntington, 20 years.
 10. Dug Pond, in Natick, to W. P. Bigelow and others, 15 years.
- Oct. 1. Farm and Learned's Pond, in Framingham, to inhabitants of Framingham, 15 years.
 1. Whitney's Pond, Wrentham, to inhabitants of Wrentham, 15 years.
 1. Little Pond, in Barnstable, to George H. Davis, 15 years.

1877.

- Mar. 1. Nine-Mile Pond, in Wilbraham, to inhabitants of Wilbraham, 15 years.
 15. Pentucket and Rock ponds, in Georgetown, to inhabitants of Georgetown, 15 years.
 Aug. 10. Onota Lake, in Pittsfield, to William H. Murray and others, 15 years.
 Oct. 1. Fort, Great Spectacle, and Little Spectacle ponds, in Lancaster, to inhabitants of Lancaster, 20 years.
 1. Battacook Pond, in Groton, to George S. Graves and others, 15 years.
 Nov. 1. Tispaquin Pond, in Middleborough, to Abishai Miller, 15 years.
 1. Asnebumskitt Pond, in Paxton, to Ledyard Bill and others, 15 years.

1878.

- Jan. 1. Sniptuit, Long, Snow, and Mary's ponds, in Rochester, to inhabitants of Rochester, 15 years.
 Mar. 16. Asnaconcomic Pond, in Hubbardston, to Amory Jewett, jun., 15 years.
 April 1. Dorrity Pond, in Milbury, to inhabitants of Milbury, 10 years.
 May 1. Spectacle, Peters, and Triangle ponds, in Sandwich, to George L. Fessenden, 10 years.
 1. Bear Hill Pond and Hall Pond, in Harvard, to inhabitants of Harvard, 15 years.
 July 1. Lake Buell, in Monterey and New Marlborough, to Andrew L. Hubbell and others, 5 years.
 Oct. 1. Eel Pond, in Melrose, to J. A. Barrett and others, 15 years.
 1. Accord Pond, in Hingham, South Scituate, and Rockland, to inhabitants of those towns, 10 years.
 1. Wright's and Ashley's ponds, in Holyoke, to Henry C. Ewing and others, 10 years.
 1. Magog Pond, in Acton and Middleton, to inhabitants of Acton, 15 years.
 Half-way Pond, in Plymouth, taken by Commissioners for 5 years from March 1, 1878, in accordance with provisions of Chap. 62 of the Acts of 1876.

1879.

- Feb. 1. Lake Mahkunac and Lake Overic, in Stockbridge, to inhabitants of Stockbridge, 10 years.
 June 1. "Bald Pate," "Four Mile," and "Stiles" ponds, in Boxford, to inhabitants of Boxford, 10 years.
 July 1. Silver Lake, in Wilmington, to inhabitants of Wilmington, 10 years.
 1. Fresh Pond, in Falmouth, to Thomas H. Lawrence, 20 years.
 Oct. 1. Pomp's Pond, in Andover, to inhabitants of Andover, 15 years.
 Nov. 1. Lake Quinapowitt, in Wakefield, to inhabitants of Wakefield 14 years.

1880.

- Jan. 1. Granite-Cove Pond, in Gloucester, to David Babson, 10 years.
- Mar. 1. Lake Winthrop, in Holliston, to inhabitants of Holliston, 15 years.
15. Massapoag Pond, in Sharon, to inhabitants of Sharon, 10 years.
- May 1. Tisbury Great Pond, in Tisbury, to Allen Look and others, 10 years.
- June 1. Indian Pond, in Kingston, to inhabitants of Kingston, 10 years.
1. Jordan Pond, in Shrewsbury, to inhabitants of Shrewsbury, 15 years.
- July 1. Swan and Martin's ponds, in North Reading, to inhabitants of North Reading, 15 years.
- Sept. 1. Herring Pond, in Eastham, to William H. Nickerson, 10 years.

1881.

- Jan. 1. Great and Job's Neck ponds, in Edgartown, to Amos Smith and others, 15 years.
- Mar. 1. The Mill Ponds (three), in Brewster, to Valentine B. Newcomb and another, 15 years.
- May 2. Nonesuch Pond, in Weston and Natick, to W. A. Bullard and others, 15 years.
- April 1. Long Pond, in Blandford, to Samuel A. Bartholomew and another, 15 years.

1882.

- Mar. 1. Blair's Pond, in Blandford, to Curtis M. Blair and another, 15 years.
- April 1. Ward Pond, alias Wightman Pond, in Ashburnham, to Herbert F. Rockwood and another, 15 years.
- May 1. Horn Pond, in Woburn, to inhabitants of Woburn, 15 years.
- June 1. Wickaboag Pond, in West Brookfield, to inhabitants of West Brookfield, 15 years.
- Oct. 1. Long and Hummock ponds, in Nantucket, to Charles E. Snow and others, 15 years.

[C.]

LEGISLATION.

[CHAP. 160.]

AN ACT relative to the Fisheries in Granite or Goose Cove Pond in the city of Gloucester.

Be it enacted, etc., as follows :

SECT. 1. David Babson of Rockport shall have the exclusive right in Granite or Goose Cove Pond in the city of Gloucester for the purpose of cultivating lobsters and other useful fish until the first day of September in the year eighteen hundred and eighty-three.

SECT. 2. This act shall take effect upon its passage. [Approved April 15, 1882.]

[CHAP. 65.]

AN ACT for the protection of Striped Bass and Bluefish in the waters of Edgartown.

Be it enacted, etc., as follows :

SECT. 1. Whoever at any season of the year shall set, stretch or draw any seine or net of any kind in any of the waters of the town of Edgartown, excepting the Oyster Pond, the Great Pond, and Job's Neck Pond, for the purpose of taking or catching striped bass or bluefish, shall forfeit the sum of one hundred dollars for each offence.

SECT. 2. Whoever shall take or catch at any season of the year in any of the waters of the town of Edgartown, excepting the ponds named in the preceding section, any striped bass or bluefish, by means of any seine or net of any kind, shall forfeit one dollar for each and every fish so taken or caught.

SECT. 3. One-half of the money recovered in any case arising under this act shall be paid to the person making the complaint and the remainder to the Commonwealth.

SECT. 4. This act shall take effect upon its passage. [Approved March 11, 1882.]

[CHAP. 53.]

AN ACT for the protection of Traps, Trawls and Seines.

Be it enacted, etc., as follows :

SECT. 1. Any person who shall take any fish or lobster from any trap, trawl or seine set for catching fish or lobsters, except by consent of the owner thereof, and any person who shall wilfully molest or interfere with such trap, trawl or seine, shall for the first offence be punished by

a fine of not less than five nor more than twenty-five dollars, or by imprisonment for thirty days, or by both fine and imprisonment; and for any subsequent offence by a fine of not less than twenty nor more than fifty dollars, or by imprisonment for sixty days, or both fine and imprisonment.

SECT. 2. This act shall take effect forty days after its passage. [*Approved March 11, 1882.*]

[CHAP. 98.]

AN ACT to provide for the preservation of Lobsters.

Be it enacted, etc., as follows:

SECT. 1. Section eighty-one of chapter ninety-one of the Public Statutes is hereby amended to read as follows: —

“SECTION 81. Whoever during the month of July in any year catches or takes from any of the waters of this Commonwealth any female lobster bearing eggs, shall be punished for each offence by a fine of not less than ten nor more than one hundred dollars, or by imprisonment in the house of correction for not less than one nor more than three months; but a person catching or taking any such lobster during said month of July, and immediately returning it alive to the waters from which it was taken, shall not be subject to such penalty.”

SECT. 2. Section eighty-two of chapter ninety-one of the Public Statutes is hereby amended to read as follows: —

“SECTION 82. Whoever during the month of July in any year sells or has in his possession with intent to sell, any female lobster bearing eggs, taken in this Commonwealth, shall forfeit for each offence a sum not less than ten nor more than fifty dollars.”

SECT. 3. This act shall take effect upon its passage. [*Approved March 21, 1882.*]

[CHAP. 102.]

AN ACT concerning the Fisheries in Great Pond and Job's Neck Pond in the town of Edgartown.

Be it enacted, etc., as follows:

SECT. 1. The lessees holding from the commissioners on inland fisheries a lease of Great Pond and Job's Neck Pond, in the town of Edgartown, may take smelts and alewives from said ponds and from the ditches connecting them with each other and with the ocean, at all seasons of the year and without restriction as to days.

SECT. 2. Whoever other than said lessees takes any fish, except eels, from either of said ponds or ditches, without the permission in writing of said lessees first obtained, shall forfeit one dollar for each fish so taken, and shall also forfeit any boat, net, line, rod or other apparatus used in such taking, in accordance with the provisions of chapter one hundred and ninety-four of the Public Statutes. [*Approved March 21, 1882.*]

[CHAP. 189.]

AN ACT to regulate the Herring and Shad Fishery in Cole's River and its tributaries, and in Milford Pond, in the county of Bristol.

Be it enacted, etc., as follows:

SECT. 1. The town of Swanzev is authorized to create herring and shad fisheries in Cole's River and its tributaries, and in Milford Pond, so called, in the county of Bristol; and the right to take herring or shad from said river or its tributaries, or from said pond, is suspended for the period of three years next ensuing after the passage of this act; and no net, seine or weir shall be set therein during said period except as hereinafter provided. The fish wardens chosen as provided by section three of this act may, however, take or cause to be taken from said river or its tributaries, or from said pond, at any time after the passage of this act, such herring or shad as may be required for the purpose of stocking said pond or any of the tributaries of said river.

SECT. 2. The town of Swanzev may sell at public auction, at a legal town meeting to be held in March in the year eighteen hundred and eighty-five, two privileges to take herring and shad from Cole's River from the first day of April to the first day of July in each year, for a period not exceeding five years, as hereinafter provided, at such places on said river as shall be designated by such fish wardens. The purchaser or purchasers of such privilege may take herring and shad with one seine, at the places so designated, from sunrise on Monday until sunset on Wednesday in each week during such period; but no herring or shad shall be taken in any manner from said waters after the first day of July in each year.

SECT. 3. The town of Swanzev, at its annual meeting in March in each year, may choose two or more suitable persons as fish wardens, who shall be sworn to the faithful discharge of their duties, and shall cause this act to be enforced and shall prosecute all violations of its terms. The fish wardens so chosen shall prevent and remove all unlawful obstructions in the course of said river or its tributaries to the passing up and down of the said fish from the first day of April to the first day of July in each year; and may, for the purposes of this act, go upon and pass over the land of any person through or by which said river or any tributary thereof runs, or which borders upon said pond, without being considered trespassers: *provided*, that any person sustaining damage in his property may have the same assessed in the manner provided when land is taken for highways. Whoever wilfully hinders or molests any such fish warden, or any person authorized by such fish wardens, in the necessary clearing of said river or its tributaries, and in the necessary and proper use of lands on said river or its tributaries, or said pond, for creating and protecting the said fishery, shall forfeit and pay a sum not exceeding twenty dollars for each offence, to be recovered in the manner provided in section four of this act.

SECT. 4. If any person other than those who have purchased such privilege as aforesaid fishes with a seine or net at any time or in any

manner, or sets any net, seine, weir, or other obstructions in any part of said river or its tributaries, or of said pond, with intent to take or destroy any shad or herring, he shall forfeit and pay twenty dollars for each offence, to be recovered on complaint, one-half to the use of said town of Swanzey and one-half to the use of the person who shall give information leading to the prosecution and conviction of such offender; and all seines, nets or weirs so used or set shall be forfeited to the person who shall give such information.

SECT. 5. All laws relating to fishing in Cole's River are repealed. [Approved April 29, 1882.]

[CHAP. 166.]

AN ACT relative to Fishing in the Merrimack River.

Be it enacted, etc., as follows:

SECT. 1. The penalties provided by chapter ninety-one of the Public Statutes relative to fishing in the Merrimack River shall not apply to or be in force against any person drawing a net or seine after the twentieth day of June in each year at any point below the Essex Merrimack Bridge in said river, unless such person shall take salmon or shad, nor shall a person taking a salmon or shad while thus lawfully fishing and immediately returning it alive to the waters from which it was taken be liable to any of the aforesaid penalties.

SECT. 2. No penalty shall be incurred by any one taking sturgeon in the tidal waters of the Merrimack River: *provided*, that no net or seine having a mesh which stretches less than twelve inches shall be used in taking the same.

SECT. 3. This act shall take effect upon its passage. [Approved April 19, 1882.]

[D.]

RETURNS OF WEIRS, SEINES AND GILL-NETS.

Returns to the close of the season (Oct. 20, 1882), have been received from 85 weirs, 33 sea-seines, and 100 gill-nets, an increase of 21, 16, and 39 respectively over the previous year.* These returns show an *increase* in the catch of shad (50 per cent.), alewives (44 per cent.), mackerel (93 per cent.), Spanish mackerel (281 per cent., but the total catch was only 397), striped bass (129 per cent.), tautog (47 per cent.), flounders and flat-fish (52 per cent.), white perch (162 per cent.). There were also given on the returns, 1,525 bonito, 4,665 "sea bass," and 175 rock bass.

The returns show a *decrease* in the catch of menhaden (68 per cent.), sea herring (7 per cent.), bluefish (8 per cent.), scup (14 per cent.), squeteague (15 per cent.), frost-fish (66 per cent.), eels (17 per cent.), and smelts (2 per cent.).

There was also a large falling off in the catch of shad in the Connecticut and Merrimack rivers, while in the Taunton River the catch of shad was more than double that of last year. There were 292 shad taken at the mouth of the Merrimack, and 897 are returned from other streams.

In the river fisheries there is a decided falling off in the catch of alewives, and a gain in that of striped bass. The two seines at the mouth of the Merrimack return a catch of 193,800 bluebacks.

* Several returns received after the tables were made up are not included in this summary. They would not materially change the percentage given.

TABLES.

TABLE NO. 1.—PONDS AND WEIRS.—*Showing the Catch of each during 1882.*

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Striped Bass.	Alwives.	Squeteague.	Mackarel.	Spanish Mackarel.	Tautog.	Flounders and Flat-fish.	Scup.	Menhaden.	Bluesh.	Bels.
Manchester,	John G. Heath,	27	7,253	2	15,400	-	15,757	-	19	32	-	-	13	200
"	Jones Bros.,	-	22,900	-	6,350	-	18,303	-	-	-	-	-	-	-
Hingham,	Thomas Weston,	-	-	-	297	-	-	-	-	-	-	-	-	-
Centreville,	T. F. Phinney,	1,765	5,519	-	19,785	78	136	-	160	258	185,177	333	500	5
Brewster,	Freeman Atwood,	88	-	553	4,542	-	2,065	-	196	-	-	-	996	34
"	James Eldredge,	20	-	154	460	-	5,225	-	-	-	-	-	1,123	-
"	N. Nelson,	125	4,000	-	-	-	132,800	-	-	-	-	-	-	-
"	V. B. Newcomb & Co.,	990	-	-	12,300	-	165,700	-	365	-	-	-	-	-
"	Parker & Ellis,	44	-	164	504	-	623	-	139	329	-	-	290	-
"	J. R. Wixon,	159	-	-	8,292	-	156,864	-	103	-	-	-	-	-
East Brewster,	T. Ellis, jun.,	-	1,980	155	650	-	-	-	-	-	-	-	3,159	-
"	Ellis & Caboon,	50	-	47	3,405	-	500	-	30	-	-	-	7,627	-
"	Z. H. Rodgers,	57	-	17	-	-	1,822	-	28	-	-	-	607	-
Orleans,	Isaac Hopkins,	104	-	5	-	-	13,755	-	-	-	-	-	1,613	-
"	Warren Hopkins,	233	-	6	-	-	16,052	1	19	-	1	-	2,994	-

"	R. E. Oliver,	146	400	51	1,300	-	25,225	-	97	-	-	10,664	-
"	Wallace A. Smith,	-	-	-	-	-	5,250	-	-	-	-	-	-
"	A. L. Walker,	54	-	31	200	-	10,745	-	95	-	-	9,843	-
Eastham,	William H. Dill,	-	-	-	-	-	2,312	-	-	-	-	82	-
"	O. W. Horton,	-	-	-	-	-	2,600	90	-	-	-	2,922	-
"	N. M. Knowles,	-	-	-	-	-	4,182	-	-	-	-	5,453	-
"	W. H. Nickerson,	-	-	-	-	-	10,329	-	-	-	-	7,899	-
"	James Savage,	-	-	-	-	-	149,950	-	-	-	-	8,180	-
"	Philip Smith,	-	-	-	-	-	125,935	-	-	-	-	31,550	-
South Eastham,	I. H. Horton,	-	-	-	-	-	137,000	-	-	-	-	11,360	-
Provincetown,	Isaac B. Lewis,*	-	3,320	177	-	-	3,571	-	-	-	4,842	13	-
North Truro,	Atkins Hughes,	88	104,467	-	-	-	419,577	-	8	-	1,083	372	-
"	P. L. Paine & Co.,	516	74,747	-	42,720	1	405,472	-	291	85	17,070	1,284	1
Truro,	N. R. Parsons,	50	43,152	-	32,730	50	186,694	-	28	-	3,059	2,004	304
Chatham,	S. F. Bearse,	1,148	-	-	101,450	-	154,835	-	-	-	-	-	-
"	Czar Weir Co.,	976	141,800	-	94,200	50	170,230	-	103	956	3,925	14	12
"	Stephen W. Gould,	4,128	153,025	10	132,202	11	148,952	-	211	1,218	5,129	459	-
"	Andrew Harding,	2,408	390,450	-	12,943	1	184,855	-	-	-	12	6	-
"	Reed Loveland & Co.,	3,112	198,800	-	171,049	22	225,252	-	309	-	-	228	-

* Also, 22,423 mackerel by drag-net.

TABLE NO. 1.—PONDS AND WEIRS.—Showing the Catch of each during 1882.—Continued.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Striped Bass.	Alwives.	Squeteague.	Mackerel.	Spanish Mackerel.	Tautog.	Founders and Flat-fish.	Scup.	Menhaden.	Bluefish.	Eels.
Harwich, . . .	J. N. Eldredge, . . .	1,059	-	1	19,066	15	20,568	-	428	90	67,473	227	141	7
" . . .	Robbins & Clark, . . .	576	5,671	1	12,419	-	42	-	-	349	-	-	-	-
" . . .	D. F. Weeks, . . .	1,510	10,395	24	46,100	18	248	-	41	2,415	479	1,790	133	-
Dennis, . . .	A. T. Chase, . . .	353	-	1	37,800	-	82,860	-	-	-	-	-	1,858	-
" . . .	Warren Crowell, . . .	-	-	-	2,830	-	-	-	-	-	-	-	-	-
" . . .	Deep Water Weir Co., . . .	220	-	8	5,750	-	212,467	-	66	118	3	-	290	-
" . . .	Nobscussett Fish Weir Co., . . .	2	-	1,177	-	-	920	-	-	-	-	-	2,402	-
" . . .	Joshua Pierce, . . .	-	-	-	-	-	-	-	-	-	-	-	3,256	-
Waquoit, . . .	T. J. Phinney, . . .	790	1,873	21	60,617	73	352	-	191	6,256	10,587	1,823	93	23
Woods Holl, . . .	Warren F. Sears, . . .	-	-	-	-	303	-	-	-	172	24,893	-	41	-
Falmouth, . . .	Prince M. Stuart, . . .	333	-	1	4,943	632	3,298	3	1,129	963	96,850	-	356	-
" . . .	Woods Holl Weir Co.,* . . .	160	-	-	8,800	1,271	28,824	-	839	501	116,825	-	709	-
Mattapoisett, . . .	A. B. Bowman, . . .	31	-	-	14,739	1,578	-	-	606	1,794	28,869	-	1,779	-
" . . .	J. B. Dunn, . . .	3	3	-	10,253	1,925	-	-	801	880	58,981	4	14	50

Fairhaven,	J. C. & J. J. Allen,	12	—	52	11,510	287	17	—	2,420	925	27,439	5	18	175
"	W. H. Bryant,	3	322	6	454	112	16	—	104	670	7,138	433	30	6
"	D. W. Deane, No. 1,	9	—	2	7,833	105	—	—	484	1,104	254	—	—	309
"	D. W. Deane, No. 2,	25	9	40	16,803	174	—	—	2,219	3,848	33,072	27	68	292
"	D. W. Deane, No. 3,	2	3	53	8,159	370	4,041	3	4,185	4,326	50,887	986	945	1,514
"	Benj. T. Dunn,	10	—	14	4,643	92	—	—	110	327	4,179	35	18	97
"	Samuel P. Dunn,	180	—	126	50,294	506	5	—	4,620	1,986	41,866	206	131	181
"	Geo. S. Hiller,	34	—	28	33,636	285	358	4	2,915	1,886	45,958	—	60	53
"	E. Mott,	24	—	1	13,218	52	31	—	1,107	390	6,084	3	29	—
"	R. W. Pease,	5	555	21	5,875	383	—	—	812	642	555	—	19	28
"	D. C. Potter,	11	27	12	14,583	585	—	—	565	880	27,249	111	41	169
"	Chas. D. Sherman,	17	1	19	14,479	237	22	—	1,435	588	14,376	19	20	185
"	Geo. R. Wixon,	18	1,925	14	10,216	212	—	—	276	405	6,072	48	170	231
Chilmark,	Richard Flanders,	399	2,450	—	2,600	1,578	3,554	—	325	6,643	71,160	—	720	—
"	H. O. Poole,	49	—	—	21,765	2,922	5,397	—	88	9,644	19,007	3	623	—
"	Daniel Vincent,	2	—	17	500	286	12,446	—	66	3,900	24,165	—	1,650	—
South Dartmouth,	John W. Cooke,	105	—	73	21,419	233	—	—	188	212	34	—	11	60
"	John Mendus,	129	4,003	22	—	491	—	54	369	743	2,737	—	5	—

* Also, 665 sea bass.

TABLE NO. 1.—PONDS AND WEIRS.—*Showing the Catch of each during 1882.*—Concluded.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Striped Bass.	Alwives.	Squeteague.	Mackerel.	Spanish Mackerel.	Tautog.	Flounders and Flat-fish.	Scup.	Menhaden.	Bluefish.	Eels.
South Dartmouth, .	Nicholas Priaule,	132	4,299	59	537	761	168	64	1,394	3,275	7,210	1,072	132	49
"	Jonas Travers,	682	13,277	73	369	11,496	92	-	1,482	2,095	111,131	86	84	2
Dartmouth, .	Joseph F. Briggs,	444	4	46	16,558	1,247	13	-	387	879	14,900	108	89	-
"	James Cook,	-	639	-	-	-	1,091	-	-	1	-	55	30	-
"	F. B. Manchester,	176	114	18	14,205	92	63	-	354	1,450	113,417	32	77	-
"	Geo. A. Snell,	462	-	21	20,528	6,263	86	1	586	1,395	186,600	-	253	-
"	Snell & Crapo,	223	-	349	31,595	2,285	-	-	622	1,227	6,177	94	463	-
"	Alvin F. Waite,	1,976	-	97	30,561	9,667	270	38	4,350	7,184	108,312	-	1,289	-
Fall River, .	John O. Babbitt,	-	-	1	-	33	-	-	136	1	1	-	2,641	-
Tisbury, .	Obed. S. Daggett,	835	-	152	58,542	2,810	197	8	190	3,010	33,571	60	1,051	-
North Tisbury, .	E. C. Flanders,†	200	-	150	11,000	210	2,850	-	-	560	59,400	-	-	-
West Tisbury, .	Amos Smith,	-	-	3	93,006	-	-	-	-	-	-	-	-	-
Nantucket, .	W. I. Fisher,	-	-	-	-	-	-	-	-	-	-	-	2,358	-
Gosnold, .	Charles C. Allen,	66	-	2	4,095	5,763	635	2	511	2,250	68,250	-	522	-
"	Charles C. Church,	18	135	1	1,550	2,762	5,328	1	226	1,498	126,930	50	99	-

.	.	Leonard A. Luce,	1	-	17	8,580	1,679	4	-	585	3,531	435	15	27	-
"	.	Charles C. Murphy,	141	3,907	2	2,427	404	623	-	117	1,009	24,915	43	399	-
"	.	W. G. Rathbun,	52	-	-	4,400	5,100	-	-	410	885	101,600	-	325	-
Unknown,	.	L. A. Luce,	2	24	122	903	1,756	58	41	572	3,089	48,010	18	81	29
Total, .	.	.	27,769	1,201,449	4,219	1,420,919	67,266	3,289,512	310	40,512	114,843	1,991,480	8,102	133,805	4,016

† Also, 4,100 sea bass, and 1,525 bonito.

TABLE NO. II. — SALT-WATER SEINES. — Showing the Catch of each for 1882.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Striped Bass.	Alewives.	Scup.	Mackerel.	Squeteague.	Tautog.	Flounders and Flat-fish.	Bluefish.	Menhaden.	Eels.	Frostfish.	White Perch.	Smelts.	Spanish Mackerel.
Provincetown,	Solomon Bangs,	.	1,500	—	—	—	900	—	—	—	1,000	—	—	—	—	—	—
"	William Dyer,	.	7,818	—	—	—	6,140	—	—	—	41	—	—	—	—	—	—
"	Thomas K. Paine,	.	9,633	—	—	—	—	—	—	—	1,962	—	—	—	—	—	—
North Truro,	Stephen Lewis,	.	—	1	—	—	—	—	—	—	778	—	—	—	—	—	—
Eastham,	Russell Doane,	.	—	—	—	—	—	—	—	—	4,305	—	—	—	—	—	—
"	Edmund F. Knowles,	.	56	7	94	—	470	810	97	20	4,127	—	100	—	—	—	—
"	Walter O. Knowles,	.	—	—	332	—	11,070	—	—	—	5,064	—	—	—	—	—	—
"	Lewis Lombard,	.	—	—	—	—	—	—	—	—	5,294	—	—	—	—	—	—
Chatham,	Horatio Howes,	.	—	306	—	—	—	—	—	—	1,618	—	—	—	—	—	—
"	Alpheus Mayo,	.	—	51	—	—	—	—	—	145	662	—	—	—	—	—	—
Yarmouth,	Hiram E. Baker,	.	292	13	12,460	1	—	2	—	123	—	5	61	—	—	—	—
"	D. B. Crocker,	.	13	698	6	1	3,164	—	2	—	1,443	—	—	—	—	—	—
Hyannis,	B. F. Lumbert,	.	7	1	—	1,453	—	—	—	—	1,794	5	—	—	—	—	—
"	Henry C. Lumbert,	.	13	—	—	7,080	—	—	—	—	2,103	—	—	—	—	—	—
Barnstable,	James A. Fish,	.	—	—	—	1,962	—	—	585	—	1,445	—	—	—	—	—	6
Westport,	Samuel G. Allen,	.	—	3	6,421	—	—	—	1	—	—	—	22	—	574	—	—

"	Perry Kirby, . . .				478						229				42	565			
"	Perry G. Potter, . . .	2			3	5,368									31				
Osterville, . . .	H. & J. Crosby, . . .				187		2,551				177	503	7,094						
Marion, . . .	Hammond & Sisson, . . .			1,050								9	143		40				
"	J. A. Arnold, . . .																		
"	Benjamin Bowditch, . . .												69						
"	Charles A. Clarke, . . .						97				66		214						
"	James Mandell, . . .										78								
"	H. Morgan, . . .	1				9,600	40,770			27	659		2,288						
West Tisbury, . . .	John W. Mayhew, . . .					17,024													
Tisbury, . . .	Allen Look, . . .				10	94,513					142						28,050		
Edgartown, . . .	Allen Mayhew, . . .												1,202						
"	J. H. Smith, . . .					16,475					514						17,625	6,500	
"	E. B. Vincent, . . .					23,550										2,610			
Nantucket, . . .	Isaac P. Dunham, . . .						60						992						
Sandwich, . . .	Geo. F. Hoxie, . . .									1,973			577						
Dennis, . . .	Nathan Kelly, . . .	838																	
Total, . . .		1,222	20,005	1,280	186,321	53,975	23,717	839	2,321	1,784	54,963	10	2,936	565	18,199	34,550	6		

TABLE NO. III. — GILL-NETS. — Showing the Catch of each for 1882.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Striped Bass.	Alewives.	Scup.	Squeteague.	Spanish Mackerel.	Mackerel.	Tautog.	Flounders and Flat-fish.	Bluefish.	Menhaden.	Eels.
Barnstable,	W. F. Carney,	2	-	-	-	-	-	-	2	-	-	1,769	-	-
"	David Rogers,	-	-	-	-	305	-	-	-	-	-	3,841	-	-
"	Moses Sturges,	-	-	-	-	-	-	-	-	-	-	326	-	-
Dennis,	Zenos H. Baker,	1	-	-	-	891	11	-	-	14	-	1,706	-	-
"	Freeman S. Crowell,	-	-	-	-	-	-	1	-	-	-	449	-	-
"	Venez Kelley,	-	-	-	-	-	-	-	-	-	-	1,278	-	-
Wellfleet,	W. F. Pierce,	65	40,280	-	-	-	-	-	116,491	148	1,810	13,283	-	-
"	W. F. Pierce, Jr.,	-	-	-	-	-	-	-	-	-	-	6,547	-	-
"	Warren Newcomb,	-	-	-	83,618	-	-	-	-	-	-	-	-	-
"	H. S. Rodgers,	-	-	-	-	-	-	-	-	-	-	5,763	-	-
Provincetown,	James F. Atkins,	-	-	-	2,840	-	-	-	10,687	-	-	493	-	-
"	D. W. Atwood,	1	7,682	-	-	-	-	-	-	761	-	5,845	-	-
"	R. Atwood,	-	5,560	-	-	-	-	-	-	-	-	-	-	-
"	Dan. F. Bangs,	-	4,850	-	-	-	-	-	5,400	-	-	1,529	-	-
"	F. M. Bowley,	-	-	-	-	-	-	-	610	-	-	-	-	-
"	Joseph M. Caton,	-	13,500	-	-	-	-	-	2,175	-	-	-	-	-

"	.	.	Nat. N. Cook,	-	-	-	-	-	-	-	-
"	.	.	George Crosby,	-	2,110	-	-	-	-	21,300	-
"	.	.	Elijah Doane,	-	8,539	-	-	-	-	4,480	-
"	.	.	J. B. Dyer,	-	765	-	-	-	-	126	-
"	.	.	William Dyer,	-	-	-	-	-	-	7,376	-
"	.	.	Joseph Ellis,	35	3,561	-	559	-	-	2,496	152
"	.	.	Alfred J. Emery,	-	-	-	-	500	-	5,165	-
"	.	.	C. H. Emery,	5	285	-	114	-	-	5,294	8
"	.	.	E. E. Emery,	-	24	-	1	-	-	2,512	-
"	.	.	Caleb Fisher,	-	-	-	-	-	-	250	-
"	.	.	Manuel Francis,	-	17,950	-	-	-	-	26,268	-
"	.	.	George W. Freeman,	-	-	-	-	-	-	4,056	-
"	.	.	H. Freeman,	-	-	-	-	-	-	1,259	-
"	.	.	John Freeman,	-	132	-	-	-	-	1,100	-
"	.	.	John E. Freeman,	-	1	1	-	-	-	895	-
"	.	.	Prince Freeman,	-	14,715	-	-	-	-	3,283	-
"	.	.	John Ghenn,	-	-	-	-	-	-	-	402
"	.	.	S. H. Ghenn and R. Atkins,	-	-	-	-	-	-	4,022	-
"	.	.	J. C. P. Harvender,	-	17,203	-	17,269	-	-	6,349	-
"	.	.	Levi B. Kelley,	-	861	-	-	-	-	6,819	-
<hr/>											
										1,544	-
										3,367	-
										1,093	-
										2,944	-
										427	-
										291	-
										52	

"	"	"	Reuben Swift, .	"	"	1,200	"	"	"	"	"	5,598	"	"	1,173	"	"
"	"	"	Abiel C. Taylor, .	"	"	977	"	"	242	"	"	2,898	"	"	502	"	"
"	"	"	Isaac Tyler, .	"	"	1,160	"	"	"	"	"	"	"	"	3,068	"	"
"	"	"	Reuben Wareham,	"	"	300	"	"	"	"	"	3,140	"	"	369	"	"
"	"	"	Edward C. Weeks,	"	"	"	"	"	"	"	"	"	"	"	603	"	"
"	"	"	John C. Weeks, .	"	"	3,281	"	"	"	"	"	1,426	"	"	729	"	"
"	"	"	Joseph E. Weeks,	"	"	5,470	"	"	"	"	"	11,604	"	"	1,038	"	"
"	"	"	Jesse Wiley, .	"	"	2,920	"	"	"	"	"	11,836	"	"	1,281	"	"
"	"	"	Charles Williams,	"	"	7,629	"	"	"	"	"	9,634	"	"	1,741	"	"
"	"	"	—————,	"	"	3,000	"	"	"	"	"	18,478	"	"	"	"	"
Truro,	"	"	Benjamin Coan, .	"	"	"	"	"	"	"	"	3,989	"	"	669	"	"
"	"	"	Charles H. Collins,	"	"	1,607	"	"	"	"	8	13,813	"	"	1,333	"	"
"	"	"	Isaac Smith, .	"	"	"	"	"	"	"	2	8,898	"	"	1,047	"	"
"	"	"	E. P. Worthen, .	"	"	"	"	"	"	"	"	7,159	"	"	"	"	"
"	"	"	Caleb N. Grozier,	"	"	1,620	"	"	"	"	"	6,078	"	"	676	"	"
Eastham,	"	"	Eldad Dill, .	"	"	"	"	"	"	"	"	4,333	"	"	"	"	"
"	"	"	John Fulcher, .	"	"	"	"	"	"	"	"	5,200	"	"	5,860	"	"
"	"	"	J. Q. Hopkins, .	"	"	"	"	"	"	"	"	1,866	"	3	4,981	"	"
"	"	"	James Penniman,	"	"	"	"	"	"	"	"	2,907	"	"	7,980	"	"

TABLE No. III. — Concluded.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Striped Bass.	Alewives.	Scup.	Squeteague.	Spanish Mackerel.	Mackerel.	Tautog.	Flounders and Flat-fish.	Bluefish.	Menhaden.	Eels.
Chatham, .	Jesse Gill, .	.	4,640	.	.	.	.	.	4,610	.	.	.	.	.
" .	John Gould, .	.	.	.	748	.	.	.	1,687	.	.	4,013	.	.
" .	James F. Smith, .	.	.	.	.	.	.	.	6,285	.	.	.	.	.
" .	John M. Smith, .	.	.	.	.	.	.	.	1,483	.	2,500	1,796	.	.
Hyannis, .	David Bearse, .	.	.	.	.	.	6	.	.	.	.	179	.	.
Centreville, .	C. E. Bearse, .	.	.	.	.	1,728	11	.	.	.	.	2,615	.	.
" .	William Hallett, .	1	.	.	.	980	6	.	.	.	.	1,941	.	.
" .	Herbert Kelley, .	.	.	.	.	1,654	.	.	.	.	.	1,714	.	.
Cotuit, .	David P. Nickerson, .	.	.	.	.	4	.	.	.	32	.	1,292	.	.
Falmouth, .	O. P. Handy, .	.	.	.	.	88	89	.	.	8	2	1,460	6	.
" .	R. T. Handy, .	352	938	60	86,069	899	387	.	22	666	4,502	108	595	44
Mattapoisett, .	Alex. B. Bowman,*	.	.	.	.	1,095	476	8	3	.	515	770	.	.
Fairhaven, .	Robert Blythe, .	.	.	.	.	705	90	.	.	16	.	2,243	1	.
" .	D. W. Deane, .	.	.	.	.	927	66	12	.	7	.	1,345	11	.
" .	George R. Deane, .	10	.	18	12,378	28,504	201	.	16	1,850	1,960	236	.	.
" .	Samuel P. Dunn, .	.	.	.	.	.	.	.	11	.	.	86	.	.

TABLE NO. IV. — CONNECTICUT-RIVER SEINES.

TOWN OR PLACE.	PROPRIETOR.	Shad.
Agawam,	A. J. Hills,	364
Longmeadow,	A. Converse,	292
Chicopee,	H. W. Chapin,	2,114
Total, . . . . .	. . . . .	2,770

TABLE NO. V. — MERRIMACK-RIVER SEINES.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Striped Bass.
North Andover,	Eben Sutton,	74	-	-
Haverhill,	Chas. E. Ordway,	31	-	-
Byfield,	Ira P. Newton,	-	2,800	-
Amesbury,	Jonathan Morrill,	282	-	1
Total, . . . . .	. . . . .	387	2,800	1

TABLE NO. VI. — TAUNTON-RIVER SEINES.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Striped Bass.
Berkley,	Isaac N. Babbitt,	1,924	91,361	-
"	F. P. Case,	687	108,323	-
"	Nichols & Shove,	1,900	180,000	-
Dighton,	E. & O. M. Buffington,	800	90,000	-
"	E. Hathaway,	2,865	150,000	44
"	Chas. N. Simmons,	1,800	160,000	-
Middleborough,	John Garland,	-	47,125	-
Raynham,	J. S. Townsend,	690	71,148	-
Taunton,	John W. Hart,	306	81,900	-
Somerset,	J. B. Hathaway,	200	50,000	-
"	Geo. H. Simmons,	1	9,415	-
Total, . . . . .	. . . . .	11,173	1,039,272	44

TABLE NO. VII. — *Other Fresh-water Seines, or Dip-net Fisheries.*

TOWN OR PLACE.	NAME.	Shad.	Alewives.	Frostfish.	White Perch.	Striped Bass.
Weymouth, . .	David Tucker, . .	-	152,400	-	-	-
Kingston, . .	Philander Cobb, . .	-	42,015	-	-	-
Plymouth, . .	E. & J. C. Barnes, . .	-	28,864	-	-	-
" . .	Wm. S. Hadaway, . .	-	-	24,000	-	-
" . .	B. F. Hodges, . .	8	20,685	-	-	-
Barnstable, . .	R. Marston, . .	-	11,680	-	-	-
" . .	E. Phinney, . .	-	137,385	-	-	-
Brewster, . .	Job Wixon, . .	-	-	-	-	-
Wellfleet, . .	George Baker, . .	-	8,631	-	-	-
Dennis, . .	Jonathan Bangs, . .	-	280,797	-	-	-
Yarmouth, . .	P. P. Aiken, . .	-	4,524	-	369	-
" . .	David S. Baker, . .	128	4,329	-	-	2
" . .	Benj. Blachford, . .	24	900	-	-	-
" . .	M. Amos, . .	-	24,683	-	-	-
Marshpee, . .	W. H. Simon, . .	-	4,775	-	-	-
" . .	W. R. Mingo, . .	-	16,050	-	-	-
Wareham, . .	Geo. Sanford, . .	-	432,000	-	-	-
Taunton, . .	G. B. Williams, . .	563	164,899	-	-	-
Mattapoisett, . .	A. H. Shurtleff, . .	-	152,666	-	-	-
Westport, . .	C. V. S. Remington, . .	-	10,000	-	-	-
" . .	Philip S. Tripp, . .	50	12,476	-	-	236
" . .	Lysander W. White, . .	-	1,714	-	45	-
South Dartmouth, . .	John Querpel, . .	124	12,820	-	-	-
Chilmark, . .	Estate H. M. Smith, . .	-	27,148	-	-	-
Edgartown, . .	A. Huxford, . .	-	7,318	-	-	-
Total, . .	. . . . .	897	1,558,659	24,000	414	238

TABLE NO. VIII. — *Seine Fishery at the Mouth of the Merrimack.*

NAME.	Shad.	Alewives.	Bluebacks.
N. Lattimer & A. Hall,	-	1,463	-
John Jannin,	292	28,150	193,800
Total,	292	29,613	193,800



EIGHTEENTH ANNUAL REPORT

OF THE

COMMISSIONERS

ON

INLAND FISHERIES,

FOR THE

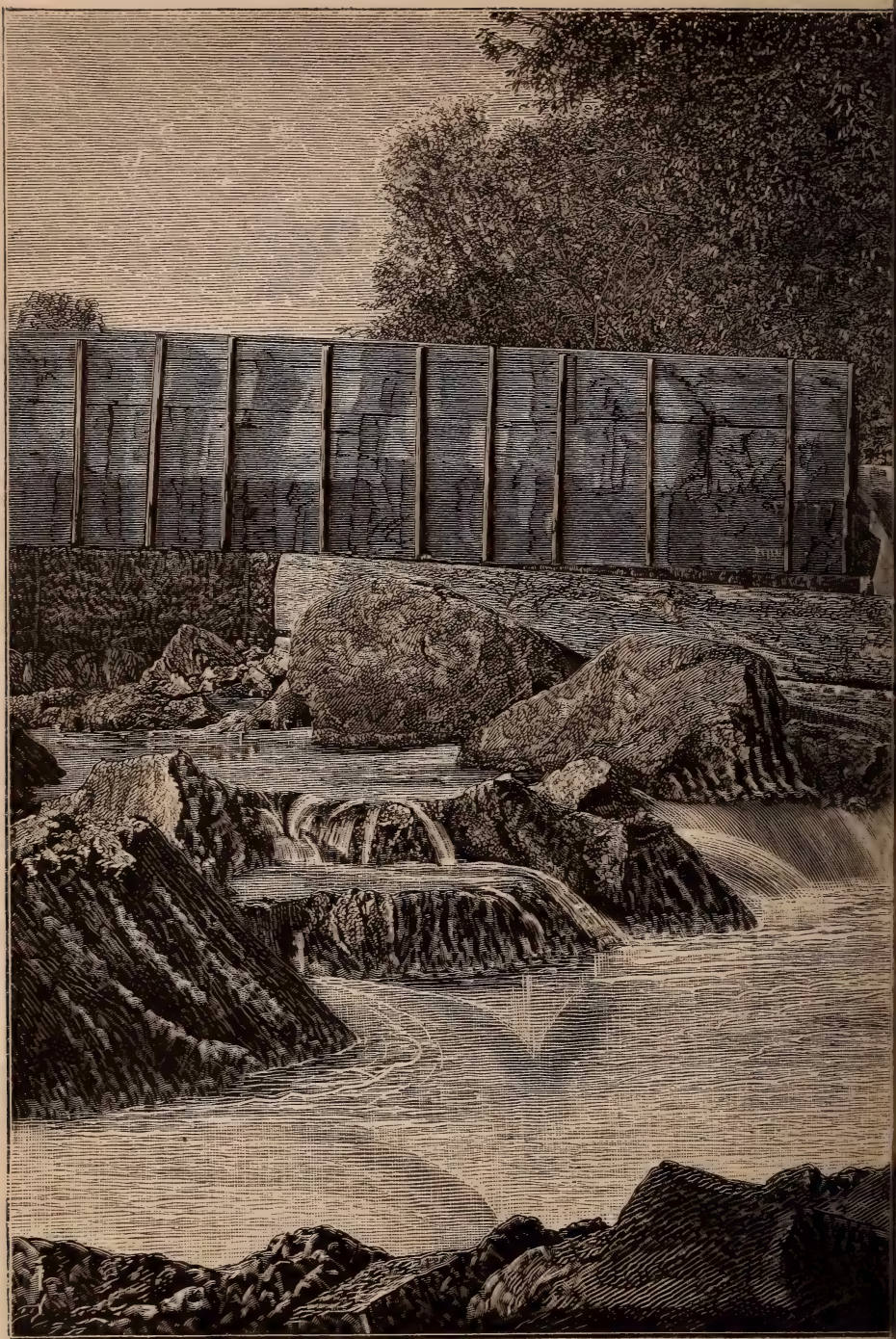
YEAR ENDING DECEMBER 31, 1883.

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FISHWAY AT PAWTUCKET



DAM, LOWELL, MASS.

Commonwealth of Massachusetts.

To His Excellency the Governor and Honorable Council.

The Commissioners on Inland Fisheries beg leave to present their Eighteenth Annual Report.

FISHWAYS.

Plans and specifications of fishways have been furnished to two owners of dams on the Acushnet River, and for two dams in South Scituate. As in former years depredations have been committed at the Holyoke fishway. Early in the season a man was recommended by the mayor and prominent citizens of Holyoke, as a suitable person to enforce the laws. He was appointed deputy, and under pretence of authority appointed an assistant, telling him that he had a right to give him permission to take fish from the fishway. The assistant, with others, commenced a thriving business by taking fish from the fishway at night, paying the deputy for the permission. Deputy and assistant were promptly arrested and fined fifty dollars and cost of court.

PAWTUCKET DAM, LOWELL.

Some misunderstanding has arisen in regard to the fishway at this place, and a petition was forwarded to the Governor, stating that "there is no fishway in this dam," and "the Commissioners have refused to order one," both of which statements are incorrect. A committee of the Council was appointed by the Governor, and the petitioners given a hearing.

In 1866 the Commissioners of this State furnished plans for a fishway which were approved by the New Hampshire Commission, and the Locks and Canal Company were requested to construct the same over their dam. The order

was promptly complied with, the fishway being finished in September of the same year, and for a period of nine years it remained as the only pass at this dam, but with little or no evidence that it was successful.

In 1875 the Company rebuilt their dam, and in so doing special reference was had to a new fishway. Fortunately the dam terminated on the Dracut side in a fall of about two feet, and by blasting a channel in the ledge a natural pass for the fish was secured. This has successfully answered the purpose for eight years, and has proved to be far better than any artificial structure which could have been erected over any part of the dam.

When the new dam was built the old fishway was not connected with it, and the new pass being situated partly under the bank, is not likely to be noticed unless specially sought for. Many of the petitioners supposed that the old fishway was the only provision made for the passage of the fish. This was apparent not only at the hearing, where but three or four of the petitioners appeared, but also from a number of them having since stated that they signed the petition under a misapprehension.

There are difficulties connected with the building of all fishways which have not been overcome.

A fishway which is perfectly successful at a medium stage of water, will with very high or very low water be more or less defective.

While the present fishway at Lowell is one of the best on the river, it is possible that in its details it may be improved, and in this the Locks and Canal Company have always shown a commendable spirit, being ever ready to make such minor changes as the Commissioners have desired. But on the other hand, they have taken the ground that unless good and sufficient reasons can be shown for the expenditure, they will resist any attempts to compel them to build a new fishway.

In the early movements of the Commissioners of this State, they found the rivers barred with dams, some of them of great height, thereby preventing the migratory fish from reaching their spawning grounds. The question of providing passes was a perplexing one and there was little to be gained

from the experience of others. Especially was this true in regard to high dams. It was evident that if good fishways could not be provided, the cultivation of migratory fish to any great extent was impossible. Much perplexity and anxiety was experienced, with no little expenditure of money, on the Lawrence fishway. The difficulty lay largely in the accelerated speed of the water as it descended the pass. All efforts to check this force resulted in producing currents which did not attract the fish upward.

It was while studying these whirlpools and circling currents, produced by efforts to break the force of the water, that it was discovered that fish in their progress up stream, are guided entirely by the current, which they follow regardless of everything else. It matters not what is the outline of the shore or how crooked the stream, so long as there is a continuous thread or current to entice them forward. This led to the discovery and adoption of two forms of fishways: first, the improved Foster, and second, what is now known as the Brackett fishway. Both were invented in 1868, but the latter was not built to any considerable extent until 1872. It is claimed that this will take from the top of any dam, no matter how high, a column of water and land it at the bottom without increase of velocity,—that the current is so slow and the water so unbroken that all kinds of fish can easily pass through it, and that it takes so little water that the manufacturing interest is not seriously injured by it. In this alone it has proved of more value to the State than the total cost of the Commission. Its complete success both here and in Europe has been fully established, marking a new era in fish culture, by making available thousands of miles of rivers heretofore closed to migratory fish. Good fishways lie at the foundation of inland fish culture and whatever tends to improve or make them effective is of great value.

In the Appendix will be found a very interesting description of a fishway spanning a fall of eighty-nine feet, on the river Sire, Norway. This pass has not only been thoroughly tested, but is, by many feet, the highest pass known. The modifications described may be, and doubtless are, desir-

able in so long a fishway (nearly half a mile), but over dams of twenty or thirty feet they are not required. We regret that the plans and drawings intended to accompany the description have not been received. The following letter will explain the cause of delay :—

MR. E. A. BRACKETT.

CHRISTIANA, NORWAY, Nov. 8, 1883.

SIR:—Excuse me that so very long time has been allowed to elapse before answering your letter of February 19, of this year. A description of the fishways on the river Sire was certainly printed for the International Fisheries Exhibition in London; but the drawings that accompanied the description, both in the Edinburgh and London exhibitions, have not been printed, and I am not in position to get a copy of them now. I have been in hopes, however, that at least some of the drawings would be published this autumn, here in Christiana, in a periodical paper for engineering, and this is the reason why I have delayed so long answering your letter. I now understand, however, that the publication most likely will not take place till later on in the winter. I therefore now send you by book-post, a copy of the description, and as soon as the drawings, or any of them, are published, I shall have the pleasure to forward to you a copy of these too.

For the interesting Reports you kindly sent me, please receive my best thanks.

Believe me to be yours very truly,

A. LANDMARK,

Inspector of Fisheries for Norway.

REPORT OF FISH SEEN IN THE LAWRENCE FISHWAY IN THE YEAR 1883.

April 22. Water let into the fishway.

May 20. Saw the first fish, a lamp eel.

20 to } The river was high. There being no flash-boards on the
June 4. } south end of the dam, while there were flash-boards
the rest of the way, caused a very strong current of
water by the end of the fishway, and although I saw
a good many alewives and suckers side of the ledge
below the fishway, I saw very few in the fishway un-
til June 4th, when the river fell some, and the flash-
boards were repaired.

June 4. Alewives, suckers and chubs, run large.

- June 5. Alewives, lampers, suckers and chubs, run very large.
6. Alewives, lampers, suckers and chubs, run large.
7. Alewives, lampers, suckers and chubs, run large.
8. Alewives, lampers, suckers and chubs, run moderate.
9. Alewives, lampers, suckers and chubs, run small.
10. Alewives, lampers, suckers and chubs, run small.
11. Alewives, suckers and chubs, run small.
12. Lampers, suckers and chubs, run small.
13. Alewives, lampers, suckers and chubs, run small.
14. Alewives, suckers and chubs, run small.
15. Suckers and chubs, run moderate.
16. Alewives and suckers, run small.
17. Suckers and chubs, run moderate.
18. Alewives, suckers and chubs, run small.
19. *Two salmon*, 15 to 20 pounds; alewives, lampers, suckers and chubs, run moderate.
20. *Ten salmon*, 10 to 20 pounds; alewives, lampers, suckers and chubs, run moderate.
21. Alewives and suckers, run moderate; lampers, run small.
22-29. A freshet in the river: never saw the water so muddy before. Scarce any fish in the fishway during this time. Think this very dirty water had a bad effect on the fish, as a salmon 3 feet long, and 17 pounds weight, was found dead in the south canal, shortly after this freshet, without a mark or scar on him.
30. Suckers and chubs, run small.
- July 1. Suckers, chubs and (small) silver eels, run small.
2. Suckers, chubs and silver eels, run small.
3. Suckers and silver eels, run small.
4. Suckers, chubs and silver eels, run moderate.
5. Suckers, chubs and silver eels, run small.
6. Suckers and silver eels, run small.
7. Suckers and silver eels, run small; one large silver eel.
8. Suckers, run small; silver eels, run large.
9. Suckers, run small; silver eels, run large.
10. Suckers, run small; silver eels, run large; one black bass.
11. Suckers, run small; silver eels, run large.
12. Suckers and chubs, run small; silver eels, run large.
13. Suckers, chubs and silver eels, run moderate.
14. Suckers, chubs and silver eels, run moderate; two black bass.

July 15-25. When water was shut out, on account of the river being low, nothing was seen in the fishway but a few suckers and chubs, and hundreds of small silver eels. During the rest of July, and the months of August and September, the river was remarkably low: water was in the fishway only on Sundays, and not always then. When water was in there were a few suckers, chubs and small silver eels in the way. During part of August and the month of September, there were six salmon lying in the pools at the foot of the dam near the bridge. They were often noticed by people on the bridge, swimming lazily about.

- Oct. 7. Let the water into the fishway, the river having risen.
9. *Two salmon* in the fishway, 15 to 20 pounds weight. Saw no fish, except a few suckers and chubs, in the fishway after October 9, to November 1.

Mr. Knowles, while making some repairs on the fishway in the spring, notified me that the planking in the bottom of the way was getting rotten. He thought that two-inch planking should be put in, all over the bottom, another year.

I should think if an addition was made to the fishway, down side of the ledge (where the fishway was built first), that it would be a great advantage to the fish when the river is high, as at such a time the water rushes by the end of the fishway, as it is now constructed, with great force.

When the river fell, the water could be shut out of the addition and turned into the present lower end of the way.

If a channel were cut through the rocks, causing a current through the pools below the dam, down to where the river runs under the bridge at low water, it would be quite a help to the fish in a low state of the river. Should think this might be done at small expense. I am informed that there are few ponds above here that alewives can get into to spawn.

Some citizens of Andover undertook to have the town of Andover clean out Fish Brook, so that the alewives could get into Haggett's Pond; but they were defeated at the spring town meeting.

It is evident if the alewives cannot get into the ponds they will not increase.

The black bass seem to have gone up the river; I hear of very few being caught in the river here at Lawrence.

Yours respectfully,

THOMAS S. HOLMES.

Arrangements have been made to re-plank the bottom of the fishway as soon as possible, and to make such other improvements as are desirable, one-half of the expense to be borne by the Essex Company.

SHAD HATCHING AT NORTH ANDOVER.

To the Commissioners on Inland Fisheries.

GENTLEMEN : — We respectfully submit the following report, containing a full account of the work of hatching shad at North Andover for the season of 1883. The hatching was opened June 6, and closed July 12.

Number of shad taken,	428
“ returned to water alive,	106
“ given away,	322
“ males,	155
“ females,	273
“ striped bass taken (weight 43 pounds),	1
“ salmon taken,	11
“ “ “ dead,	1
“ “ returned to river alive,	10
“ alewives taken,	80
“ suckers, chubs and eels,	220

The amount of shad spawn taken was estimated to be fully 1,607,000, and from this about 1,250,000 fish were hatched. Of this number 650,000 were shipped by rail to the Fish Commissioners of New Hampshire. They were carried in ice-water in twenty-gallon cans, and I am informed by the Commissioners' agent, who had charge of their transportation, that the fish were safely carried, none dying on the route. They were turned into the Merrimac, at Franklin, Fisherville and other points above Concord.

Eighty thousand were turned into the river above the dam at Lawrence, 450,000 at North Andover, and 20,000 sent in charge of Mr. Peabody to be put in the Ipswich River.

Fifty thousand died in the hatching boxes while being held over the Sabbath for shipment. The rapid rise of water and sudden fall of temperature, June 23, caused a loss of 200,000 spawn.

The amount of spawn taken was 380,000 in excess of last season, while the number of shad taken was 226 less.

The plank boom in the form of a triangle fully met our expectations, and very much lessened the labor of attendance upon the hatching boxes.

The following table gives the number of shad taken each day, the proportion of males to females, the temperature of the water

and air, the times of hauling the seine, the number of fish taken at each sweep and the estimated amount of spawn secured.

DATE.	Shad taken.	Males.	Females.	TEMPERATURE.		Time of hauling seine.	Fish per sweep.	Estimated amount of spawn taken.
				Water at 7 p.m.	Air at 7 p.m.			
June 6, .	30	18	12	71	76	5, 7, p.m.	20, 10,	000
" 7, .	13	5	8	72	68	6, 7, "	12, 1,	40,000
" 8, .	15	8	7	73	70	5, 6, 8, "	10, 5, 0,	40,000
" 9, .	3	2	1	74	70	5, 8, 9, "	0, 2, 1,	6,000
" 11, .	10	3	7	75	69	6, 7, 9, "	0, 10, 0,	75,000
" 12, .	13	5	8	76	70	7, 8, 9, "	1, 9, 3,	30,000
" 13, .	19	5	14	75	69	7, 8, 9, "	1, 16, 2,	100,000
" 14, .	2	1	1	74	70	7, 9, 10, "	1, 1, 0,	4,000
" 15, .	9	4	5	74	68	7, 9, "	2, 7,	35,000
" 16, .	22	12	10	72	65	8, 9, 10, "	5, 11, 6,	135,000
" 18, .	16	7	9	72	68	8, 9, 10, "	0, 7, 9,	60,000
" 19, .	24	11	13	72	67	7, 8, 9, "	12, 4, 8,	70,000
" 20, .	16	1	15	73	69	7, 8, 9, "	9, 3, 4,	20,000
" 21, .	13	5	8	72	70	8, 9, 10, "	6, 3, 4,	25,000
" 22, .	12	5	7	72	68	7, 8, 10, "	5, 4, 3,	60,000
" 23, .	4	1	3	67	67	1, 3, "	7, 9,	000
" 25, .	26	7	19	71	70	7, 8, 9, "	10, 6, 10,	250,000
" 26, .	30	11	19	72	70	7, 8, 10, "	5, 18, 7,	250,000
" 27, .	19	4	15	72	68	6, 7, 8, "	7, 6, 6,	100,000
" 28, .	19	6	13	73	72	7, 8, 9, "	7, 6, 6,	70,000
" 29, .	18	2	16	74	80	8, 9, 10, "	7, 8, 3,	50,000
" 30, .	13	3	10	75	60	8, 9, 10, "	6, 5, 2,	70,000
July 2, .	13	4	9	74	70	7, 8, 9, "	3, 6, 4,	000
" 3, .	9	3	6	75	71	8, 9, 10, "	3, 1, 5,	30,000
" 5, .	18	7	11	76	75	7, 8, 9, "	6, 4, 8,	50,000
" 6, .	14	8	6	78	80	8, 9, 10, "	3, 5, 6,	25,000
" 7, .	6	3	3	78	80	8, 9, "	3, 3,	000
" 9, .	9	2	7	75	65	8, 9, 10, "	2, 5, 2,	12,000
" 10, .	8	3	5	73	67	7, 8, 9, "	2, 3, 3,	000
" 11, .	5	2	3	76	70	8, 9, "	2, 3,	000

In order to avoid the killing of salmon while fishing for shad, a new seine of two and one-half inch mesh was furnished by the State. It fully accomplished its purpose, none being killed while using it, although several fine ones were taken, varying in weight from fifteen to twenty-five pounds. In using this seine of small mesh many young shad were taken, evidently one and two years of age, being about from four to ten ounces in weight.

We carefully examined these fish and found them to be the same as those taken by fishermen at the mouth of the river and sold under the name of *sea-shad*. The fishermen there claim that this species of shad do not ascend the river; but the taking of them at North Andover has fully demonstrated the fact that a seine of two and one-half inch mesh will take them anywhere on the river for a distance of twenty-five miles from its mouth. It is also claimed that the young shad taken at the mouth of the river are all male fish. Very true; those taken at North Andover, twenty-five miles from the mouth were all male fish. The male shad one and two

years of age follow the mother fish to the spawning grounds in fresh water, while the young female fish whose powers of reproduction are not matured, remain in salt water, the true feeding ground of the shad which ascend our rivers for the purpose of depositing their spawn and for no other purpose; and female shad without spawn are seldom if ever taken in fresh water. Sea-shad, if there is any such fish, must necessarily derive its name from the fact that it is a constant inhabitant of the sea, and, like the codfish finds its spawning ground in salt water.

A careful comparison of the shad taken at the mouth of the river with those taken twenty-five miles above, cannot fail to convince any unprejudiced mind that the term sea-shad is not to be applied to any fish that are caught to any extent in the Merrimac.

The work of hatching shad to re-stock the river is simple in itself, and the number hatched may be increased threefold at a small expense, thereby securing a large return of fish. Notwithstanding this fact it seems to me that your Honorable Board must see the difficulty in attempting to re-stock the river while five or six seines of small mesh are annually destroying thousands of young shad inside of the line fixed by the Governor and Council defining the mouth of the river.

The value of a few hundred barrels of bait, that could be caught elsewhere, is insignificant compared with this destruction of young shad.

In re-stocking the river every available means should be used to protect the young fish, and not *one part* but the interests of the fisheries on the *whole river* should be considered. To allow a few fishermen here and there to control or destroy the entire rights of others is a matter that does not admit of any argument.

The fish-laws of the Merrimac, with the exception of permitting the use of seines of less than two and one-half inch mesh, at the mouth of the river, are ample for all practical purposes. From a careful investigation, extending over a series of years, we are forced to the conclusion that the interests of fish culture demand that these laws should be more thoroughly enforced.

Yours respectfully,

B. P. CHADWICK.

EDWIN F. HUNT.

SEPTEMBER 10, 1883.

BROOK TROUT (*Salmo fontinalis*).

There were received from the Plymouth hatching-house, N. H., last year, 75,000 eggs from which were hatched about 63,000 young fish. This year there is an increase of 50,000, making 125,000. The young fish will be delivered free, at the hatching-house, Winchester, next spring. Persons desiring them should make early application, first, because the cooler the weather the easier to transport them; and secondly, unless all orders are in before any distribution is commenced it is difficult to apportion them. The demand is greatly in excess of the supply; but arrangements have been made to cover the deficiency as soon as possible. The distribution last spring was as follows:—

	CANS
Henry Goulding, South Natick,	1
Geo. W. Cowden, Rutland,	1
W. H. Foote, Westfield,	3
A. L. Hubbell, Great Barrington,	3
John Alden, Stoneham,	3
H. H. Wyman, Winchendon,	1
Geo. Kellogg, Sheffield,	2
Ivers Adams, Dorchester,	2
Eben Sutton, North Andover,	1
S. W. Lincoln, Adams,	1
S. L. Lincoln, “	1
Geo. H. Weld, Rochester,	1
Geo. T. Newbegin, Salem,	1
Alex. McDonald, Jamaica Plain,	1
Wm. H. Means, Tewksbury,	1
D. White, Oxford,	1
M. O. Adams, Ashburnham,	1

LAKE SUPERIOR SALMON TROUT.

One hundred thousand eggs of this trout were received last fall from Mr. Welsher, of Milwaukee, Wis., from which 90,000 young, healthy fish were obtained.

These fish are for large and deep ponds, and are not suitable for shallow waters.

It is probable that about the same number will be for distribution next spring.

Those of last year were distributed as follows :—

	CANS.
Will Perham, Tyngsborough,	1
A. L. Hubbell, Great Barrington,	1
John Cort, Webster,	2
H. H. Wyman, Winchendon,	1
D. R. Dean, Oakham,	1
S. S. Thompson, Globe Village,	1
W. S. Holbrook, Sutton,	2
George H. Weld, Rochester,	1
Charles Goshlau, Oxford,	1
W. H. Wheeler, Millbury,	2
M. H. A. Evans, Graniteville,	2
George H. Poor, Andover,	2
Enos W. Boise, Blandford,	1
Nathaniel Wales, Stoughton,	2
George M. French, Holliston,	1
Daniel Crosby, Stoneham,	1
Herbert F. Rockwood, Boston,	1
Thomas Lawrence, Falmouth,	2
C. A. Bronson, Ashfield,	1

RAINBOW OR CALIFORNIA MOUNTAIN TROUT (*Salmo iridae*).

Through the kindness of Prof. Baird, 3,000 eggs of these fish were received last spring, from which about 2,500 fry were obtained.

It was intended to send them to the Plymouth (N. H.) hatching-house for breeding fish, but, through mistake, this was delayed so long that it was thought best to dispose of them in other ways, and they were placed in a stream under the care of Hon. John Cummings, where they will be looked after, and their adaptation to streams in this climate tested.

LAND-LOCKED SALMON. (*Salmo sebago*.)

Last year there was received from the Schoodic establishment, about 195,000 eggs of this fish. They came in excellent condition and hatched well, and were distributed as follows :—

	CANS.
J. S. Howe, Shrewsbury,	2
J. W. Winslow, West Brewster,	4
Myron W. Whitney, Boston,	2

	CANS*
H. H. Wyman, Winchendon	1
Ivers Adams, Dorchester,	3
W. S. Holbrook, Sutton,	4
B. P. Chadwick, Bradford,	1
William Lawrence, Worcester,	4
Thomas Lawrence, Falmouth,	4
Abishar Phinney, Waquoit,	4
H. F. Rockwood, Boston,	3
W. A. Bullard, Cambridgeport,	4
A. L. Hubbell, Gt. Barrington,	2
Erastus Howes, Gloucester,	1
— Hull, Stockbridge,	6
John Loring, Boston,	2
Mystic River,	6

The number of fish in the cans varied, intentionally, according to temperature and the distance to which they were to be transported. The average number to a can was about 3,500.

The amount due this State this year is somewhat less, being only about 120,000.

ATLANTIC SALMON (*Salmo salar*).

For the amount of spawn received by the State from the Penobscot establishment last season, and for the distribution of the young fish, see Report of Commissioner Hodge, Superintendent of the State Hatching-house, at Plymouth, N. H.

As the Penobscot establishment for Atlantic salmon, and the Schoodic for land-locked salmon spawn, are the sources of supply of spawn of these fish, we append a description of them by Chas. G. Atkins, Asst. U. S. Commissioner and Superintendent of these works. It was intended for last year's report, but came too late. *See Appendix.*

The amount of Atlantic salmon spawn due the State this year, is about 338,000.

To the Commissioners on Inland Fisheries for the Commonwealth of Massachusetts.

After my report to you of Dec. 4, 1882, there were received at the hatchery from Bucksport, Me., in January, 315,000 Penobscot salmon eggs; 100,000 of them were given by Prof. Baird to

New Hampshire. These, with the eggs taken at the hatchery from the salmon that came up the Merrimac, making over 400,000, were hatched with a loss of less than two per cent., and were planted in the Pemigewasset River in June. Sixty thousand of them were carried twenty miles up the river and the remainder were planted at various points from two to ten miles above the falls. The young fry were very strong and healthy and as the water had become warm enough to furnish food, good results may be expected from them.

The severe drought seriously interfered with the run of salmon this year, making three years in succession of unusually low water.

The spring run was late and the low water prevented the fall run from reaching here. Many salmon passed the fishway at Manchester in October and must have spawned in the river below here.

The salmon taken here this season were much larger than last year, showing that we have not yet received any return from the plant of 1880.

From one fish, forty inches in length, 15,000 eggs were taken.

The young salmon (parr and smolts) were very plenty in the river this season, and we must soon have a large increase of adult fish from the heavy plant of the last three years, of over 400,000 each year.

There are now in the hatchery 230,000 eggs of the brook trout, and, when all taken, there will be about 250,000, of which one-half will be sent you as soon as sufficiently developed.

I have added over 2,000 trout this summer and shall add 3,000 next year as there are not enough breeders to supply the demand for young trout.

I have taken a few eggs from the Sälbling or German trout, the first ever taken in this country, and have also crossed 2,000 trout eggs with the Sälbling.

The large trout-pond has been planked around the edge, and two tanks, each eight by twenty-five feet, have been built for the accommodation of the brook trout added this year. It will be necessary to still further increase the room for trout another season, which can be cheaply done by building a new pond above the present one large enough to hold three or four thousand small trout.

The new supply of water added to the hatchery last year, being four degrees colder than that from the old spring, retarded, as was anticipated, the hatching of the young fish from fifteen to twenty days and the young fry were very strong and healthy.

E. B. HODGE, *Superintendent.*

GERMAN CARP (*Cyprinus carpio*).

In former reports attention has been called to the importance of these fish and the opportunities found on almost every farm for cultivating them; also a description of the kind of pond best adapted to their wants, which is here repeated:—

Carp ponds should be flowed loam or grass land, the deepest part running through the centre, sloping to the outlet, where it need not be over five or six feet deep. The rest of the pond should be shallow. This would enable the cultivator to control the water, and by drawing it off slowly bring all his fish into a small compass. Very little more water is needed than will supply the evaporation. When streams are dammed for the purpose of making ponds, the overflow may be taken around the pond and the supply from an inlet at the upper end or side. The fish may be fed on all kinds of vegetables. Where the pond is large they will obtain a large part of their food from the pond. It is a question of pasturage and feed as to the number kept in a pond of a given size. As their food is inexpensive, being easily obtained on any farm, the keeping of large numbers in a small place may be often desirable. Water-snakes, frogs, and every kind of fish that prey upon other fish should be kept out of the breeding pond, or any other place where the young carp are kept.

Notwithstanding this description and the oft-repeated statements published elsewhere, constant applications are being made for these fish to be placed in large ponds containing all kinds of carnivorous fish, where nothing but utter destruction awaits them.

Such applicants have no just cause to complain if their requests are not complied with. The delivery of the carp is on condition that the persons applying have suitable places for them.

No farmer would be so unreasonable as to put his chickens among hawks; neither would any man, if he stops to reflect a moment, be so foolish as to turn young carp into water swarming with their enemies ready to devour them as soon as they strike the water.

Arrangements have been made to deliver the fish free, at the State hatching-house, Winchester, the only charge being

twenty-five cents for a pail to transport them in, when parties do not provide for that part of the work. A tin pail holding about a gallon is all that is necessary to carry from twenty-five to fifty fish. When parties cannot come for them they can be sent by express.

On the 9th of November, through the kindness of Prof. Baird, U. S. Commissioner, four thousand of these fish were received at Winchester, and although they were on the road four days they came in excellent condition, with a loss of only thirteen fish. Nearly half of these have been distributed. Application for carp should be made in the fall, or, in other words, this is the best time to deliver them. With the present arrangement there appears to be no reason why the supply will not be adequate to the demand.

From their prolific character and rapid growth, it would naturally be supposed that the edible qualities of the carp were not of the highest grade. It is fortunate that we do not all think alike, and that our likes and dislikes are sufficiently varied to enable us to utilize, in some form, all the good things with which nature has so bountifully provided us.

In the Appendix will be found an extract from the U. S. Report on Fisheries containing the statements of two hundred and forty-two persons who have eaten carp. To these varied opinions those who desire information upon that point are respectfully referred.

REPORT OF THE FISHERIES ON THE MERRIMAC BELOW DEER ISLAND.

For the season ending Sept. 1, 1883, there have been about three thousand two hundred and fifty (3,250) barrels of bait, mostly menhaden, taken by the fishermen of Newburyport this season. Of this amount about three hundred barrels were what is known here as blue-backs. Among these blue-backs taken during the months of July and August, I noticed, in looking over the catch, quite a number of shad one and two years old. From observations made at the shad-hatching establishment at North Andover during the past season, I am satisfied that what the fishermen call sea-shad, which they claim do not run above brackish water, are no other than the white or true shad of the river.

Shad taken at North Andover in July, and submitted without ex-

planation to a number of the fishermen, were decided by them, without hesitation, to be sea-shad. It would be easy to settle this question with these fishermen by giving them the same opportunity that I had last summer. On June 20 and 21, there were excited reports of great shoals of sea-shad in the river, and, at the request of the fishermen, the mayor telegraphed to your Board for permits in accordance with an Act passed by the last legislature.

That there was no apparent foundation for these reports was evident from the investigation made by Mr. Jeffers of Haverhill and myself, a statement of which is herewith submitted:—

JUNE 25, 1883.

TO E. A. BRACKETT, *Chairman of the Board of Commissioners on Inland Fisheries:*

DEAR SIR, — Agreeable to your request, we went to Newburyport on the 22d inst., and presented your letter to the mayor, Mr. Johnson.

He received us very agreeably, and seemed much pleased with the contents of the letter. He saw some of the fishermen that night. We went the next morning (23d) to the fishing grounds quite early and saw all the hauls the fishermen made with their nets, with *not one shad of any kind appearing*. There were only two kinds of fish — *blue-backs* and *pogies*. The fishermen agreed in saying that while there was so much freshet in the river there would not be shad there. On the 25th we chartered a sailboat and went to the fishing grounds, but found no one fishing. Returned and examined the bait caught Sunday. We found several so-called sea-shad among the pogies. The seiners threw them into the water with rather unpleasant indifference to us.

Very truly yours,

WM. JEFFERS,
EDWIN F. HUNT.

A reference to the report on shad-hatching at North Andover, part of the time under my charge, will show that shad were taken freely on the 22d, 23d, and 25th of June, notwithstanding the high water.

In August parties from Rockport came to Newburyport and caught two hundred barrels of menhaden, one hundred and fifty of which were used for salt bait, and the balance sold fresh. They used gill-nets, as to the legality of which I was in doubt, and before I had settled the question in my own mind they had taken up their nets and were gone.

In my last report I called attention to the injury being done with small mesh seines. I have seen no reason to change my opinion. On the contrary, I am more than ever convinced that if the fisheries of the Merrimac are to be maintained, the use of small mesh seines should be discontinued.

The fishermen of Newburyport have privileges which no others on the river have.

They should then be willing to compromise when the general interest is affected, otherwise, as the public becomes enlightened upon the importance of fish culture, they may lose the confidence of those to whom they now look for support.

EDWIN F. HUNT.

PONDS AND STREAMS.

As far as can be judged from the imperfect returns from the inland waters, there has been a decided gain over previous years.

The partial failures can be easily accounted for. It is with water as with land, — some ponds, as some farms, are naturally better adapted to the production of large crops than others. The lack of success in culture is largely due to want of skill and intelligent management. Not at our bidding, not into our out-stretched hands does nature drop her treasures. She yields only to patient, well-directed labor. The want of this is felt in almost every department of fish culture. It is apparent in the common practice of many towns of selling, annually, at auction, their interest in the alewife fisheries to parties whose sole object is to take all they can, regardless of the future. No one would apply this principle to farming.

Were it not for the wonderfully prolific nature of the alewife they would all have been destroyed long ago. As it takes three years from the time they are hatched to return mature fish, the evil of overfishing is not apparent until long after the mistake is made.

It is difficult to understand why intelligent people, who know the habits of these fish, should continue this practice.

There is not a stream in the State where these fish are found that could not, with a little care and labor, be made to produce tenfold its present yield. It is a question whether it would not be a wise policy for the State to compel the opening of all rivers and streams to the cultivation of alewives and maintain them at a high standard. There is no other way in which it is possible to produce so large an amount of food at so little expense. They are also used as bait, and

form no small item in the outfit of vessels engaged in the sea-fisheries, while the influence they would have in restoring our inshore fisheries is too important to be overlooked. Prof. Baird thus speaks of them :—

“The value of the alewife is not fully appreciated in our country. It is, in many respects, superior to the sea-herring as an article of food ; is, if anything, more valuable for export, and can be captured with vastly less trouble, and under circumstances and at a season much more convenient, for most persons engaged in the fisheries.”

Of the ponds leased by the towns, up to the present time, not more than half the returns have been received. The law requires that lessees shall make annual returns of the number and estimated weight of fish caught. The leasing of ponds is for the purpose of ascertaining, as far as possible, their value, and it must be evident that unless returns are made no just estimate can be given.

In France the return is about four dollars per acre, and there is no reason why, with a little experience, we should not exceed that.

There are 196,342 acres of land covered with water in this State which, at the same rent, would make annual returns of over seven hundred thousand dollars. Some of our ponds have done even better.

The difficulty which some of the towns experience in managing the ponds is largely due to rotation in office.

To make the matter a success two or three good men who feel an interest in such matters, should be appointed to take charge of the pond during the term of lease. Several towns have adopted this plan with good results.

Some of the lessees appear to have no idea that they are required to do anything beyond the mere fact of obtaining the lease. This is shown by the following return made by the chairman of selectmen of one of the towns :—

“I do not know much about it, but I guess it has been pretty good fishing. I live on the road to the pond, and have seen several persons go by with large strings of fish.”

As most of the permits issued by the lessees, for fishing, are returnable on the first of December, it is not easy to obtain the results in time for the report for the current year. The town of Stockbridge issued three hundred and fifty permits last spring, and of this number only sixty have been returned up to the present time. These returns indicate a catch of something over six thousand, of which about three thousand were black bass.

The Pittsfield pond which, two years ago, gave a catch of 23,579 fish, has not been heard from this year.

Of the fresh-water fish, such as black bass, white perch, pickerel, etc., six leased ponds have returned for this year, an aggregate catch of 63,305, the average weight per fish being about one pound.

RETURNS OF WEIRS, SEINES AND GILL-NETS.

Compared with those of 1882, the returns of the past season show a decrease of 22 in the number of fisheries reporting. Eighty-seven pounds and weirs, 24 sea-seines, 88 gill-nets, and 40 fresh-water seines, are represented in the tables; giving a decrease of sea-seines (9), gill-nets (12) and fresh-water seines (3), and an increase of weirs (2).

While efforts have been made by the Commissioners to supply with blanks and send notifications to all fishermen required to make returns, yet the tables show an entire absence of returns from certain localities where, undoubtedly, fisheries were carried on.

The law of 1876 requires all owners of pounds, weirs and other fixed contrivances, as well as of seines and gill-nets, to apply to the Commissioners for suitable blanks on which to make out their returns. The failure to comply with this law is due in most instances, probably, to ignorance of the law and its object.

Valuable statistics upon this important source of food supply are of such vital importance to the State that it is to be hoped that in future a more extended interest will be taken, and a more united effort made by the fishermen, upon whom the State relies for this information.

In this connection it is gratifying to acknowledge the receipt, during the year, of numerous letters which show that

there is a large class of intelligent fishermen who are willing to do all in their power to provide the proper statistics, realizing the importance of such statistics to their own interests as well as to the business of the State.

It will be seen by Table VIII., that there has been a large falling off in the total catch of shad. The Taunton and Merrimac river fisheries return less than half the number of shad caught in 1882. The catch of shad in the Connecticut River is small, although slightly larger than that of 1882. Complaints of obstructions in Connecticut waters have been received from our Connecticut River fishermen.

More salmon than usual were seen to pass up the Merrimac River last spring. The returns show a falling off in the catch of sea-herring, alewives, Spanish-mackerel, blue-fish, striped-bass, scup and tautog, and a large increase in the catch of menhaden, showing that this fish is again becoming abundant on our coast. There is also a gain in the catch of mackerel, squeteague, flat-fish and eels.

The following communication was received after the copy for this report had been sent to printers, but as the suggestions made require the most careful consideration it is deemed advisable to insert the paper here in order to draw attention to the subject. That the laws in relation to weirs are defective there seems to be no doubt:—

PROVINCETOWN, Dec. 13, 1883.

To the Board of Inland Fisheries:

GENTLEMEN, — During the last few years the fish weir, or, more correctly, the catching of fish by means of fish weirs, has assumed an importance which could not and was not foreseen when the present law was enacted, and owing to the rapid growth of this industry many complications arise every year, which the present law seems wholly inadequate to meet, and some of its provisions are so vague that it is causing many altercations and disagreements between the land owners and the selectmen. For instance, the clause “provided such weirs cause no obstruction to navigation and do not encroach upon the rights of other persons.” I can find no law that clearly defines what the rights of land owners bordering upon tide waters are. The law in regard to riparian ownership does not seem to wholly cover the ground, as by that law they would seem to have no right below 100 rods, provided the tide ebbed that far, whereas section 13, chapter 19 of the Public Statutes would indi-

cate that they have rights to the harbor line. Take, for instance, the action of some of the selectmen. They have granted a large part of the shore privilege for putting down weirs to *one man, wholly debarring three-quarters of the land owners from any privilege whatever*, claiming they have the right so to do, because in constructing these weirs part of the structure was built below low-water mark, notwithstanding section 13 says the owners of the land or flats shall have "equal proportional privileges." In my opinion the whole matter should be taken from the hands of selectmen, and placed under the jurisdiction of the "Commissioners of Inland Fisheries," where local affairs and influence cannot be brought to bear, and where selectmen cannot secure any more than their proportional privileges, as was the case in a matter brought to the attention of the "Committee on the Fisheries" during last session, in which it was proven that the selectmen had secured one-half the privileges for themselves. The obstruction to navigation clause also needs defining. I think it would be a very good plan to have what might be designated a fish-weir line described, beyond which no weirs should be constructed, and also defining the rights of riparian owners inside of said line, so as to obviate all future trouble. This matter has been brought to the attention of the Harbor and Land Commissioners, and if your honorable body should deem it advisable, I respectfully ask that mention be made in regard to this matter in your forthcoming annual report, making such suggestions as you may think proper.

I have the honor to most respectfully submit the foregoing to the consideration of your honorable board.

Respectfully,

E. E. SMALL.

FISHERIES ON THE LOWER MERRIMAC.

No inconsiderable portion of the time of the fish committee of the legislature, during the last two sessions, was taken up by the claims put forth by the fishermen of Newburyport for the privilege of taking *sea-shad* at the mouth of the Merrimac. Beyond the assertion that these fish never enter fresh water there was no evidence produced at the hearings that they differed materially from the true shad. The existence of a new species of shad on our coast was not probable, for all authorities now agree in there being only one species, the *Alosa sapidissima* (Syn. *Alosa præstabilis*, De Key). Jordan refers the shad to the genus *Clupea* and calls the fish

Clupea sapidissima. It is thought that the shad from the different rivers can be designated ; but only as slight local varieties, not as species.

The following are our Clupeoids as given by Jordan, in his synopsis, 1883 :—

- Clupea harengus*. Common herring, “whitebait” (young).
- “ *mediocris*. Hickory shad, tailor herring, fall herring.
- “ *vernalis*. Alewife.
- “ *æstivalis*. Blue-back, glut herring.
- “ *sapidissima*. Shad.

The Hickory Shad.

Clupea mediocris, Mitchell.

“ *mattowacca*, “
Alosa lineata, Storer.

Pomolobus mediocris, Gill.

“ “ Goode & Beans’ list, 1879.

This fish extends along the coast from Newfoundland to Florida. We can find no statements of its going into fresh water. (There is, however, another fish which has the same common name—hickory-shad or gizzard-shad—found in the Ohio and other western rivers ; but this fish belongs to the genus *Dorosoma*.)

Capt. Atwood, in answer to an inquiry, says :—

“I am not aware that the hickory shad ever go in fresh water, —they visit us annually in small numbers, and are only taken occasionally in nets when fishing for other fish.”

This is the only fish that can with any propriety be called *sea-shad*, as, according to the best information we can obtain, it lives and spawns in the sea and does not, to any extent, run into the rivers of this State. As an edible fish it is not desirable and is so distinct from the common shad that no one could mistake one for the other. This certainly cannot be the shad that the fishermen of Newburyport desire to catch, for it is worthless as food, and furthermore, there is no evidence that they ever enter the Merrimac.

What, then, could have been their object in pressing for the privilege of taking shad at times prohibited by law through-

out the State. There can be no doubt that there has been at long intervals a phenomenal movement of shad along our coast. Capt. N. E. Atwood, than whom there is no better authority, thus speaks of it :—

About 1840 there appeared on our coast, south of Cape Cod, large quantities of shad, which appeared to be the same species with those that visit the Connecticut and Merrimac Rivers annually (*Alosa præstabilis*). Fishermen from Massachusetts, Connecticut and Rhode Island engaged in the fishery and found it profitable. In 1842 an Act was passed by the legislature to prohibit fishermen from other States, from fishing for shad within a line drawn from Monomoy Point to Point Gammon. I myself engaged in this fishery, but we found there was no need of the passage of such an act. The shad appeared in small numbers, so that not enough were caught to pay expenses. They were also caught in large quantities in the waters north of Cape Cod. They then disappeared, so that only a few straggling specimens have since been caught in these localities. Where were they before they appeared in our waters? What was the cause of their coming? Where are they now? All that can be said in answer, I can say in three words,—they are gone.”

They came suddenly upon the coast, entering the bays and mouths of rivers, remaining but a few days in a place, and then disappeared. It is difficult to form a definite idea of the extent of this school of fish. They are said to have come in vast shoals. It was stated by one man who watched them carefully that the shore was lined with them as far as the eye could reach, and if fishermen had been prepared for them they could have made a fortune.

Fish stories are luxuriant in their growth, often assuming proportions that rival the tales of Arabian Nights. It is, however, certain that these shad were caught in some places in considerable numbers. So far as we know, this unusual movement of shad has occurred but once since 1840. That they were fish that had spawned in more southern waters, and, from some unknown cause, were moving along our coast, is probable.

For the purpose of enabling the fishermen to take advantage of such an influx, should it ever occur again, the legislature has authorized the Commissioners, at their discretion,

to grant permits. These permits were not intended to cover the ordinary fishing of the rivers.

Very little is known of the habits of migratory fish after they leave fresh water. While we have conceded that it is possible that these shad belong to other rivers, there are certain facts which make it more than probable that during the late summer and autumn migratory fish do not, as a rule, go far from the mouths of rivers to which they belong, and that they frequently enter them on the incoming tide and return with the ebb. As shad run in schools it is not unlikely that they remain in the bays and estuaries until the young come down in the autumn and both old and young move together to their winter grounds. Salmon that spawn at the headwaters of our rivers in the fall do not return to the sea until the next spring, and the smolts or young salmon go down at the same time.

Previous to the restocking of the Merrimac with salmon they were seldom taken by the weirs on either side of the Cape, but since then a great many have been caught in weirs and gill-nets. In fact it may be said that many weirs are deriving considerable benefit from the restocking of the river. One weir is reported to have caught, in one season, over twenty salmon. The salmon is naturally a very hardy fish and quite tenacious of life, yet by some strange fatality they always die when they get into the weirs.

Shad, one, two and three years old can be taken at North Andover until the 20th of July, and are found more or less abundant on the lower part of the river throughout the whole season. The taking of these fish and the using of small mesh seines which destroy the young shad that go down in October and November is a serious, if not fatal, injury to the fisheries of the river.

It is entirely in relation to this that conflict has arisen between the fishermen of Newburyport and the State. There is not and cannot be any disposition to deprive them of any reasonable amount of fishing. They should remember that their fishing grounds comprise a very small portion of a large river, which takes its rise in and runs through a large part of another State, and that they have the key to the fisheries of the whole river, which for that reason should be

properly guarded. The laws regulating fisheries are made for the benefit not of the *few* but of *all*.

When the fishermen accept this and live up to it in good faith, there cannot be any conflict between them and the interests that should govern the fisheries of the river in its course through both States.

E. A. BRACKETT.

ASA FRENCH.

F. W. PUTNAM.

EXPENSE OF COMMISSION.

Salary to Dec. 1, 1883,	\$1,650 00	
Travelling and other expenses,	126 94	
	<hr/>	\$1,776 94

GENERAL EXPENSES.

Hatching Works near Livermore Falls:—

E. B. Hodge, services,	\$375 00	
Assistants "	86 25	
Repairs,	32 82	
Express,	15 95	
Rent,	50 00	
Tanks,	13 00	
Fish meat,	13 09	
	<hr/>	586 11
Subscription to fund of Penobscot Salmon Breeding Estab- lishment,		502 69
Thos. S. Holmes, labor and stock, Lawrence Fishway,		74 16
Use of boats, nets and premises at North Andover,		50 00
Robert R. Holmes, services and expenses,		117 66
Edwin F. Hunt, " "		394 85
B. P. Chadwick, " "		96 40
E. S. Robinson, " "		31 00
Robert Elliot, " "		60 00
Wm. Jeffers, " "		83 40
W. F. Brackett, plans and specifications,		24 70
Repairing dam at Middleborough,		51 80
Legal services in the matter of taking Half-way Pond at Plymouth,		17 50
Rent of land, hatching-house at Winchester,		50 00
J. C. Walker, services,		18 00
Expressage,		44 85
Printing,		25 10
Cans for transporting fish,		60 00
Pails for transporting carp,		20 00
Fish net,		35 28
Rope and twine and salt,		6 86
		<hr/>
		\$1,127 30

APPENDIX.

[A.]

LIST OF FISH COMMISSIONERS.

DOMINION OF CANADA.

W. F. Whitcher, Commissioner, Ottawa, Ontario.

PROVINCE OF NEW BRUNSWICK.

W. H. Venning, Inspector of Fisheries, St. John.

PROVINCE OF NOVA SCOTIA.

W. H. Rogers, Inspector, Amherst.

PROVINCE OF PRINCE EDWARD ISLAND.

R. H. Duvar, Inspector, Alberton.

PROVINCE OF BRITISH COLUMBIA.

A. C. Anderson, Victoria.

THE UNITED STATES.

Prof. Spencer F. Baird, Washington, D.C.

ALABAMA.

Col. D. R. Hundley, Mooresville.

Hon. C. S. G. Doster, Prattville.

ARIZONA.

Hon. J. J. Gosper, Prescott.

Hon. Richard Rule, Tombstone.

J. H. Taggart, Business Manager, Yuma.

ARKANSAS.

John E. Reardon,	Little Rock.
James H. Hornibrook,	Little Rock.
H. H. Rottaken,	Little Rock.

CALIFORNIA.

J. D. Redding,	San Francisco.
A. B. Dibble,	Grass Valley.
B. H. Buckingham,	Washington.

COLORADO.

Wilson E. Sisty,	Idaho Springs.
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CONNECTICUT.

Dr. W. M. Hudson,	Hartford.
Robert G. Pike,	Middletown.
G. N. Woodruff,	Sherman.

DELAWARE.

Enoch Moore, Jr.,	Wilmington.
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GEORGIA.

Hon. J. T. Henderson, Commissioner of

Agriculture, Atlanta.

Dr. H. H. Cary, Superintendent of Fisheries.

Under the laws of the State these two constitute the Board of Fish Commissioners.

ILLINOIS.

N. K. Fairbank, President,	Chicago.
S. P. Bartlett,	Quincy.
S. P. McDole,	Aurora.

INDIANA.

Calvin Fletcher,	Spencer, Owen County.
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IOWA.

B. F. Shaw,	Anamosa.
A. A. Mosher,	Spirit Lake.

KANSAS.

W. S. Gile, Venango.

KENTUCKY.

Wm. Griffith, President, Louisville.
 P. H. Darby, Princeton.
 John B. Walker, Madisonville.
 Hon. C. J. Walton, Munfordville.
 Hon. John A. Steele, Versailles.
 W. C. Price, Danville.
 Dr. W. Van Antwerp, Mt. Sterling.
 Hon. J. M. Chambers, Independence, Kenton County.
 A. H. Goble, Catlettsburg.
 J. H. Mallory, Bowling Green.

MAINE.

E. M. Stilwell, Bangor.
 Henry O. Stanley, Dixfield.

MARYLAND.

Thomas Hughlett, Easton.
 G. W. Delawder, Oakland.

MASSACHUSETTS.

E. A. Brackett, Winchester.
 Asa French, South Braintree.
 F. W. Putnam, Cambridge.

MICHIGAN.

J. C. Parker, President, Grand Rapids.
 A. J. Kellogg, Detroit.
 John H. Bissell, Detroit.

MINNESOTA.

1st District—Daniel Cameron, La Crescent.
 2d District—Wm. M. Sweeney, M. D., Red Wing.
 3d District—Robert Ormsby Sweeney, Presi-
 dent, St. Paul.

MISSOURI.

John Reid, Lexington.
 J. G. W. Steedman, Chairman, . . . 2803 Pine Street, St. Louis.
 J. S. Logan, St. Joseph.

NEBRASKA.

R. R. Livingston, Plattsmouth.
 William L. May, Fremont
 B. E. B. Kennedy, Omaha.

NEVADA.

Hon. Hubb G. Parker, Carson City.

NEW HAMPSHIRE.

Geo. W. Riddle, Manchester.
 Luther Hayes, South Milton.
 Elliott B. Hodge, Plymouth.

NEW JERSEY.

Theodore Morford, President, Newton.
 Richard S. Jenkins, Camden.
 William Wright, Newark.

NEW YORK.

Hon. R. Barnwell Roosevelt, President, 76
 Chambers Street, New York.
 Gen. Richard U. Sherman, Secretary, New
 Hartford, Oneida County.
 Edward M. Smith, Rochester.
 Eugene G. Blackford, 809 Bedford Avenue, Brooklyn.

NORTH CAROLINA.

S. G. Worth, Raleigh.

OHIO.

Col. L. A. Harris, President, Cincinnati.
 Chas. W. Bond, Treasurer, Toledo.
 Halsey C. Post, Secretary, Sandusky.

PENNSYLVANIA.

Hon. B. L. Hewit,	.	.	.	.	.	Holidaysburg.
James Duffy,	.	.	.	.	.	Marietta.
John Hummel,	.	.	.	.	.	Selin's Grove.
G. M. Miller,	.	.	.	.	.	Wilkesbarre.
John Gay,	.	.	.	.	.	Greensburg.
Arthur Maginnis,	.	.	.	.	.	Swiftwater.

RHODE ISLAND.

John H. Barden,	.	.	.	.	.	Rockland.
Henry I. Root,	.	.	.	.	.	Providence.
Col. Amos Sherman,	.	.	.	.	.	Woonsocket.

SOUTH CAROLINA.

Hon. A. P. Butler, Commissioner of Agriculture,	.	.	.	.	.	Columbia.
C. J. Huske, Superintendent of Fisheries,	.	.	.	.	.	Columbia.
These two officers constitute the Fishery Commission.						

TENNESSEE.

W. W. McDowell,	.	.	.	.	.	Memphis.
H. H. Sneed,	Chattanooga.
Edward D. Hicks,	Nashville.

TEXAS.

John B. Lubbock,	Austin.
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VERMONT.

Hiram A. Cutting,	Lunenburg.
Herbert Brainerd,	St. Albans.

VIRGINIA.

Col. Marshall McDonald,	Berryville.
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WEST VIRGINIA.

H. B. Miller, President,	Wheeling
C. S. White, Secretary,	Romney.
N. M. Lowry,	Hinton.

WISCONSIN.

The Governor, *ex officio*.

Philo Dunning, President,	. . . . .	Madison.
C. L. Valentine, Secretary and Treasurer,	. . . . .	Janesville.
J. V. Jones,	. . . . .	Oshkosh.
J. F. Antisdel,	. . . . .	Milwaukee.
Mark Douglas,	. . . . .	Melrose.
C. Hutchinson,	. . . . .	Beetown.

WYOMING TERRITORY.

Dr. M. C. Barkwell, Chairman,	. . . . .	Cheyenne.
Otto Gramm, Secretary,	. . . . .	Laramie.
N. L. Andrews,	. . . . .	Johnson County.
E. W. Bennett,	. . . . .	Carbon County.
P. J. Downs,	. . . . .	Uinta County.
T. W. Quinn,	Sweetwater Co.

WASHINGTON TERRITORY.

Albert B. Stream,	North Cove.
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[B.]

SALMON BREEDING ESTABLISHMENT IN MAINE.

BUCKSPORT, MAINE, December 30, 1882.

To the Commissioners on Inland Fisheries, Commonwealth of Massachusetts.

GENTLEMEN:—In response to your request for a sketch of the condition of the Penobscot and Schoodic salmon-breeding establishments, and of the work of collecting spawn, I beg leave to submit the following:—

1. THE PENOBSCOT ESTABLISHMENT.

Here we are concerned only with the large migratory salmon, the natural inhabitants of all the rivers of eastern North America, north of the Hudson. The Penobscot River enjoys the distinction of being the only river in the United States whose fisheries of this species are sufficiently productive to warrant an attempt to collect its spawn on a large scale. For the past twenty years, the yield of the river, though far smaller than in early times or even than forty years ago, has varied from 5,000 to 15,000 salmon annually, the average being much nearer the lower figure.

The natural breeding ground of these salmon is in the wild country at the headwaters in all the gravelly tributary streams, where they are to be found digging their nests on the shallow rapids in October and November. The difficulties attendant on catching the salmon and securing their spawn at that inclement season of the year, in a wilderness where the fish are scattered far and wide and where no established fisheries exist, led to the organization of an establishment near the mouth of the river, where the salmon can be taken in large numbers as they are passing upward in May and June, and impounded until the breeding season arrives. There was, in the beginning, some doubt whether in confinement the reproductive functions of the fish would act normally; but the first experiment yielded favorable results, and with the proper arrangement of details the operations are attended with complete success.

The supply of the adult salmon is obtained from a few of the numerous fish weirs built every year about the mouth of the Penobscot. The fishermen who own them are furnished proper dipping gear and with cars in which to transport the fish to headquarters. These cars are made out of common dories, by providing them with grated openings, fore and aft, and a cover of netting. About low water, when the salmon are mostly taken from the weirs, they are brought together at a central point in the fishing district, counted, adjudged as to weight, replaced in the cars, ten to fifteen in each, and despatched to the enclosures, which are located in a fresh-water stream called "Dead Brook," a tributary of Eastern River, which in turn joins the Penobscot at its very mouth. The total distance from the collecting station at the south end of Verona to the enclosure is not far from seven miles, and the transfer is made without any other delay than that attendant on the passage through a lock at Orland.

The enclosure is simply an ample portion of the brook (about one hundred rods), fenced off securely, above and below, by grated barriers. The width of the brook is two to four rods, the current gentle to sluggish, the bottom in part gravelly but in greater part muddy, the water clear and never failing, the depth from five to ten feet. It appears to be admirably adapted to our purpose.

At the upper end of the enclosure are located the fixtures for recapturing and manipulating the fish. By the end of October they are nearly all ready to yield their spawn and milt. The methods employed do not differ much from those generally in use. The milt is applied to the eggs before they are put into water and the rate of impregnation is high. It rarely happens at this establishment that a female salmon yields any imperfect eggs, so far as the eye can distinguish,—something I should be glad to say also of the Schoodic salmon.

The hatching-house is located on the east shore of Alamoosook Lake, two miles from the salmon enclosure,—an inconvenient feature, but unavoidable, as no good site could be obtained nearer. But the task of transferring the eggs is not very great and in all other respects the facilities for developing and hatching the eggs are unsurpassed in my observation. A crystal brook supplied by one of the purest of lakelets, "Craig's Pond" by name, and reinforced by numerous springs, comes tumbling down over a rocky bed to the hatching-house. There is practically no limit to the supply of water, and nothing lacking as to aeration. We were troubled at first by the warmth of the spring-water, which hastened the development of the spawn unduly, and compelled us to send part of it away early in December; but an aqueduct 1,500 feet in length,

taking its supply from the brook above the springs, now brings us a supply of cold brook-water, so that we have a choice between cold and warm, and can delay the shipment of spawn to a convenient date.

The work of the present season may be summed up in a few words. There were purchased 587 salmon. The losses from sundry causes, known and unknown, foot up 147. The remaining 440 were recaptured in the fall and found to embrace 184 males, 256 females. A little more than 2,000,000 of eggs were secured, of which the most forward are at this date about ready for shipment. The three hundred dollars contributed by Massachusetts will entitle her to about 220,000 eggs.

2. SCHOODIC ESTABLISHMENT.

The Schoodic salmon belong to the group of "land-locked salmon." They pass their whole lives in fresh-water, the lakes being their main abode, the streams being resorted to occasionally for feeding, but mainly for breeding purposes. There are four river systems in the State of Maine that contain these "land-locked" salmon; namely, the Penobscot, the Piscataquis (a branch of the Penobscot), Union River and the St. Croix. They are most abundant in Grand Lake and its outlet, Grand Lake stream, in the Schoodic system, on the west branch of the St. Croix. Grand Lake stream is their main breeding ground, and thither they resort in thousands every autumn, a little later than the spawning time of the Penobscot salmon.

It being the habit of these salmon to feed during all the summer and early autumn, it would not answer to enclose them in June as we do the Penobscot fish. The securing of a stock of breeding fish must be therefore deferred until the near approach of the spawning season, generally until the most forward of the fish have actually begun to spawn, which occurs the last week in October. By Nov. 20 or 25, the fish are generally all manipulated and returned to the lake. The capture is much facilitated by the fact that the main body of the fish are moving down from the lake into the stream. A series of enclosures spanning the entire width of the stream, constructed of fine-meshed nets, planned on the principle of a river fish-weir, intercepts and secures almost the entire school of fish.

The Schoodic salmon are pigmies compared with the Penobscot salmon and inferior to their brethren of Lake Sebago and Union River, but yet are quite respectable in size for a fresh-water fish. For several years there has been a marked increase in the average size of those taken at Grand Lake stream, and it is now not far

from two and one-half pounds, specimens weighing between three and four pounds being common, and those of five and six pounds occur now and then. This year the condition of the fish has been the best and they have yielded the smallest proportion of defective eggs that I have ever known at Grand Lake stream. A curious fact is that the normal size of these eggs is decidedly greater than that of the migratory, sea-going salmon, though the disparity in size is quite the reverse.

The location of a developing and hatching house at this station has given us much trouble, there being no available site that combined all the desiderata in a fair degree. We have now three houses for the purpose. The principal one is located near the lake shore, a few hundred feet above the dam that commands its outlet and very near to the fishing ground. The house is supplied with spring-water only, but being located on a hillside the facilities for aeration and repeated use of the water are excellent, and there is always an abundance of water for hatching out the twenty-five per cent. reserve which has been established, at first by custom and later by law, as the proportion to be returned to the lake to avoid exhausting the supply; and with an additional aqueduct, which appears feasible, I think the entire stock of eggs (if not over 2,000,000) could be carried through the whole winter safely. This house covers about 1,500 square feet of ground, is well-built and very convenient. Near it are a cottage for the superintendent, a lodge for the foreman, an ice-house and woodsheds. The second hatching-house is by the side of the stream, about a quarter mile distant from the first, supplied with cold lake-water. This is used every winter until March. The third house is back in the woods half a mile from the stream and supplied with spring-water only. It is used only in emergency.

The present season we have taken about 1,600,000 eggs. The subscription of Massachusetts, five hundred dollars, will entitle her to about 175,000 eggs.

Very respectfully submitted.

CHAS. G. ATKINS.

[C.]

SALMO SALAR.

So much has been said and written about salmon and salmon-fishing that it seems almost useless to attempt to say anything more on the subject; but as some of the readers of fishery reports may have never had their attention called to the subject, a brief mention of some of the characteristics of the fish may not be out of place.

From time immemorial the salmon has been considered the king of fishes. His habits, his beauty of form and proportion all indicate his superior breeding.

The true *Salmo salar*, so far as known, is found only in the rivers flowing into the Atlantic Ocean north of forty degrees of north latitude, principally those of Norway, Great Britain and the east coast of North America.

In former years nearly all the rivers of New England were abundantly stocked with this valuable fish, and it is to be deplored that with the march of civilization, which has been blind to the importance and value of fresh-water fish as an article of food, they have been almost entirely exterminated.

Hendrik Hudson, when he discovered the beautiful river which bears his name, reported "seeing stores of salmon leaping from its waters." The last fish seen there was killed at Troy in 1840. How long since they disappeared from the Connecticut I am unable to say; but it was many years ago. The Merrimac contained a few fish within my own recollection. The building of the dam at Lawrence, however, proved their death-knell for a number of years; but thanks to the perseverance and energy of our Fish Commissioners it is again well stocked with salmon. There are none in the Saco or Androscoggin, and only a few in the Kennebec, which in former years furnished a large proportion of the salmon sold in our markets.

The Penobscot is the only river of importance which has not long ago been closed to their passage. Formerly it was one of the

most prolific rivers of which we have any knowledge, and under proper restrictions could no doubt be restored to its former condition. Until last year net-fishing was not prohibited in any of the rivers in the State of Maine; and it is a well-known fact that there were taken, a few seasons ago, from one pool, near what is known as Hunt's farm, on the east branch of the Penobscot, 684 full-grown salmon. The effect of such wholesale slaughter of *parent fish* is sad to contemplate. The law recently enacted provides that no salmon shall be taken above *tide-water* in any manner except with single baited hook and line, or artificial fly.

Salmon, together with all other migratory fish, always return to the river in which they are bred, *and to no other*. As it requires a dam of only about ten feet in height to effectually bar them out, the importance of erecting proper fishways over all dams can scarcely be over-estimated.

They enter the fresh-water streams at times varying somewhat according to locality. In many of the rivers of Great Britain, fly-fishing begins as early as the middle of March; in the Provinces of Quebec and New Brunswick, not till the middle or last of June; at which time the heaviest run of fish takes place, lasting usually till the middle or last of July, after which time only a few stragglers are seen entering the fresh water.

A large proportion cast their spawn during the month of October and a few as late as the middle or even the last of November. It is a well-known fact that they take no food of any kind whilst in the fresh water, and, as a natural consequence, the longer they remain the poorer they become. Their silvery coat-of-mail is gradually changed to one of a dull blackish copper color, and the beautiful fish which left the sea in June or July, becomes in September an object of disgust, neither pleasing to the eye or fit for food.

All authorities admit that salmon cast nearly a thousand ova for every pound of their weight. Such being the case, one would very naturally infer that any fish furnishing so large a number of eggs would very soon over-stock an ordinary river. So they would had they not so many enemies. The sea-trout, which abounds in all Canadian salmon rivers, devours not only thousands of ova, but depends mostly upon the small fry of salmon for their daily food. Next comes the sheldrake and king-fisher, who can each stomach at least twenty small fish per day; and last, not least, comes man, who resorts to every possible artifice to destroy them; but of all weapons used, the Indian spear is the most deadly. Fortunately there is a heavy penalty of both fine and imprisonment for using it in Canada, and also, I believe, in Maine and the

other New England States. If there is not there ought to be. In the Dominion of Canada the fishery laws are *obeyed* and have rarely to be *enforced*. Public sentiment is in favor of protecting the fisheries, and there is not annually reported more than a dozen cases of infringement.

It is to be hoped that our own people will soon realize the importance of increasing the fish supply of our inland waters, and lend a helping hand to the efforts of the Commissioners, and thereby enable them, by hearty co-operation, to realize the possibilities of fish culture and do their share towards re-stocking our streams and ponds with valuable food-fishes.

The fish of each separate river have a distinctive individuality, so marked that an expert can always determine by their external appearance what stream they were taken from. The difference is no doubt principally owing to local peculiarities of both food and water. They are keen of sight, detecting the slightest movements, but they are oblivious to sound. They possess to a wonderful degree the sense of smell. This last statement can be easily proved by placing a small quantity of ova in the current of a stream (fastened, of course, so that it will not drift away). In a very short time it will be surrounded with large numbers of small fish, which have come invariably from below, whence the odor of the spawn has been carried by the current.

The instinct of salmon to reach their spawning grounds is one of their strongest characteristics. Heedless of danger, they will press forward, overcoming obstacle after obstacle with an energy and determination which ought to always command success: such, however, is not the case. At one of the falls on the Columbia River, Oregon, many thousands of the Pacific salmon are annually killed in their frantic attempts to leap the fall, by being thrown back upon the jagged rocks at the foot of the rapids. Those that succeed have to travel many hundred miles inland, and reach their destination so weak and emaciated that it is doubtful if, after casting their spawn, they have strength enough left to enable them to reach the sea again.

Of their haunts and habits whilst in the salt water nothing is positively known. Their movements still remain a mystery. The closest observation has thus far failed to determine with any certainty, whether they remain near the shores and around the mouths of rivers, or whether they go far out to sea. The fact that they are never taken on trawls or hand-lines whilst fishing for deep-sea fish, but on the contrary are often taken in stake-nets and weirs, long distances from the mouth of any salmon stream, would certainly tend to prove that they do not venture far from shore.

Localities which they frequent are doubtless determined by the question of food, which consists of all manner of small fish, capelin and sand-eels being a favorite diet.

They are often taken in the estuary of the Penobscot as early as the month of February, by smelt fishermen when drawing their nets under the ice. There are also taken every year in the St. John, near the mouth of Indian River, from fifty to one hundred salmon between the 15th and 30th of November, in first rate condition for the table; plump and fat, the milt and ova in an undeveloped state. These and a few other facts furnish sufficient data upon which to build a theory, and it is to be hoped that more extended research and closer observation may yet solve the mystery, or at least throw more light on the subject.

WALTER M. BRACKETT.

Boston, December 10.

[D.]

DESCRIPTION OF SALMON PASSES,

On the river Sire, Norway, by A. LANDMARK, Government Inspector of Fisheries.

The river Sire (pronounced See-ra), which falls into the North Sea about midway between Christiansand and Stavanger, has a total length of about 146 kilometres (90 English miles), and drains about 1,870 square kilometres (722 English square miles). During the greatest floods—that occur, however, only at intervals of many years—the river discharges close upon 41,000 cubic metres of water a minute. The volume when the river is dryest (as a rule in or about the month of March) has not been accurately determined; but to judge from an approximate computation, it can hardly exceed 300 cubic metres a minute. Having for a considerable distance an elevated bed (from 500 to upwards of 1,000 metres above the level of the sea), and flowing, on well-nigh the whole of its course, between lofty and precipitous mountains, the river passes through a number of lakes, the two largest of which are the Lundevand (length 14 English miles, area 10 English square miles) and the Sirdalsvand (length 17 English miles, area 7 English square miles), both situate in comparative proximity to the mouth of the river. Owing to the great length of the catchment-basin, all the tributary streams are comparatively small; the largest of these, the Moi, flows—not to mention several smaller sheets of water—through the Hovevand, a lake of some extent, and, after a course of about 18 English miles, falls into the upper end of the Lundevand. Nearly all the other affluents have an exceedingly rapid fall.

Originally, the Sire was not accessible to salmon for more than a few hundred yards above the estuary, the river at that short distance from its embouchure pouring down in a fall, the Logsfos, 8.5 metres (28 English feet) high, which presents an insurmountable obstacle to the further ascent of salmon. About 1,200 metres

above the Logsfos, there is another and far more obstructive fall, the Rukanfos, with a total perpendicular height of 27.2 metres (89 English feet). From the trifling extent of water previously open, salmon were never particularly abundant in the river, and the yield of the salmon fisheries has always been very inconsiderable compared to the size of the river.

Now, however, the salmon-passes at the Logsfos and the Rukanfos enable the fish to surmount those falls; and thus about 50 miles of lake and river are rendered easily accessible to salmon, the river being now open up to the falls of Lindland, on the main river, and to a short distance above Rusdal, on the Moi. In the above-mentioned lakes, which, throughout the greater part of their extent are remarkably deep, with rocky and precipitous shores, salmon find a safe retreat, where, with comparative facility, they can avoid capture, while the reaches of river above the lakes afford plenty of excellent spawning-beds. Hence, it is quite certain that, the Logsfos and the Rukanfos being now passable, the salmon producing capacities of the river are enormously increased, and, more especially, from the Sire flowing through a tract distinguished, it should seem, by the most favorable conditions for a productive salmon-fishery, the deleterious effects of extremely cold in winter being less severely felt in that region than is the case throughout the greater part of Norway.

The entire extent of the water-course is shown in Plate I* (scale $\frac{1}{40000}$), the catchment-basin of the Sire being colored red, with black transverse lines indicating the extreme limits of the reaches of the rivers rendered accessible to salmon by the passes.

That part of the river that extends from the Lundevand to the estuary, and between which, as stated above, both the Rukanfos and the Logsfos are situate, is shown on a larger scale ($\frac{1}{2000}$) in Plate II., which also contains a plan of the salmon-passes at the said falls, together with a longitudinal section of the river (the elevations on 10 times as large a scale).

The pass at the Logsfos is comparatively simple, consisting as it does in greater part of a channel dug through a natural depression on the left bank of the river, in the layer of stones and gravel, and for which there has been but little need of blasting and masonry. This channel, into which the water flows a couple of hundred yards above the falls, pouring out some few yards below them, in the exact spot where the salmon principally congregate, has a total length of 320 metres (1,050 English feet). Its breadth varies, but is nowhere less than 2.2 metres at the bottom, whence the sides

* The drawings referred to have not yet been received.

slope upwards, with an incline of 1 in $1\frac{1}{2}$. The actual outlet consists of a short conduit, blasted in the solid rock, only 1 metre wide and about 2 metres deep, with well-nigh perpendicular walls; and in order that the whole body of water shall force its way through this narrow passage, a stone wall, 16 metres long and $2\frac{1}{2}$ metres high, has been erected immediately above the outlet. By this means, the volume of water is discharged from the channel as a rapid and slightly foaming stream, that cannot fail to attract the attention of salmon, though never attaining sufficient force to impede in the slightest degree the passage of the fish. The upper part of the pass has for a considerable distance a gradient of only 1 in 200, which gradually increases, the 70 lowest metres inclining 1 in 15. With so gentle a slope, there is no need of stops, or any other additional appliances, to facilitate the ascent on the greater part of the pass; but where the gradient is 1 in 15, and the channel extends between perpendicular rocks, a series of transverse wooden barriers, placed at a relative distance of 5 metres, serve to break the fall, the top of each barrier lying one-third of a metre lower than that preceding it.

With a view to diminish the excavation in the upper part of the channel, a dam is building across the river, close to the edge of the Logsfos, to secure, when the water is lowest, a depth of water of 0.7 metre, in the upper part of the pass.* During ordinary summer floods, the water in that part of the pass rises even now to the height of 1 to $1\frac{1}{2}$ metre, and in heavy floods higher still. Hence the average volume of water at present even is very considerable, viz., with a depth of $1\frac{1}{3}$ metre, circa 460 cubic metres (about 15,000 English cubic feet) a minute, or more than the whole body of water discharged by the river when lowest. With a view to protect the pass, and preserve it from damage during heavy floods, the proprietors think of erecting at the inlet a flood-proof dam, provided with sluices and with an apparatus for the capture of salmon, principally parent fish, from which to procure spawn for artificial hatching.†

A longitudinal section of the pass is given in Plate IV. As will be seen from the figure, the bottom of the pass at the outlet is very nearly on a level with the surface of the river when lowest, whereas the bottom at the inlet is 0.64 metre below the top of the Logsfos dam.

The figure in Plate VIII shows the outlet of the pass in perspective.

* Part of this dam being still in course of construction, no water flows at present into the pass when the river is *very* low.

† The dam here alluded to, was built during the spring of 1883.

Far more complex and imposing is *the pass at the Rukanfos*, which, indeed, up to the present time, so far as I am aware, has no rival in point of extent and difficulty of construction. The total height of the fall that had here to be overcome, amounts, as previously stated, to not less than 27.2 metres (89 English feet); and the rugged and precipitous rocks on all sides encompassing the cataract leave but very little space for the construction of a salmon-pass. Moreover, the periodical floods are of the heaviest, and the depth of the water both at the head and at the foot of the falls varies exceedingly, the greatest difference being as much as 6.6 metres (21.6 English feet). Hence special provision has been needed, not only to obtain space sufficient for the channel, but also to insure the pass against damage during the floods, and to render it effective whatever may be the height of the water.

Referring to the annexed illustrations (Plates III., IV., V., VI. and VII.), a detailed description is here given of this interesting salmon-pass.

By reason of the limited space, it was necessary to make choice of a system that would admit of a comparatively steep incline. Hence, the pass has been constructed chiefly on Mr. E. A. Brackett's system,* with only a few minor modifications, that were found advantageous. The pass, which has a total length of 285 metres (935 English feet) is principally of wood ($2\frac{1}{2}$ inch planks); the first 73 metres only have had to be blasted in the solid rock. The wooden part (saving a few metres at the commencement of the pass) inclines 1 in 8 on its upper half, and on the remainder 1 in 7, whereas the slope of the channel blasted in the mountain-wall does not exceed 1 in 180.

The wooden part of the pass has a breadth of 2.82 metres, and — excepting the part nearest the outlet — a depth of 1.18 metres. The stops, with a height a trifle less than have the outer walls of the channel, viz., 0.94 metre, is, as previously stated, on Mr. E. A. Brackett's system, but differs from the drawings annexed to the description given in the above-mentioned Report from United States Commission of Fish and Fisheries in the following details:—

1. The opening B (see plan in Plate V) is 4 inches wider than are the openings A, C and D, whereas, in Mr. Brackett's figures, these openings have all the same width.

2. At A and E, a stop 8 inches high, wanting in Brackett's illustrations, is placed across the bottom of the channel.

These modifications serve to give the water a more uniform velocity at every point of the pass.

* Described in Report from United States Commission of Fish and Fisheries, Part II, (for 1872 and 1873), p. 612.

The complex structure required for the wooden part of the channel, must obviously to a very considerable extent increase the length of the passage. The entire distance which salmon have to traverse in ascending from the outlet to the inlet of the pass amounts to about 785 metres, or very nearly half an English mile.

As will be seen from the elevation (Plate IV.), the outer walls of the pass are highest at the outlet, their surface being horizontal on the 23 lowest metres, whereas the bottom of the pass retains throughout this part the same incline that it has for some distance above it, viz., 1 in 7. Such being the case, the walls attain at the outlet a height of not less than 4.2 metres. The stops reach on this part, too, almost up to the top of the walls.

The object sought to be attained by this peculiar construction, which has never previously, I believe, been tested, is to increase, in a twofold manner the attractiveness of the pass. From the very great difference in the depth of the water at the outlet—varying as it does with the height of the river not less than 6.6 metres—the water in the channel, were the walls at the outlet of the same height as they are above it, would, during floods, inevitably overflow throughout a considerable part of the pass and thus seriously diminish the force of the current at the outlet, which, in that case, might easily fail to attract the attention of salmon. By reason of the increase in height given to the walls of the channel, the whole body of water, even in flood-time, is now made to pour through the narrow opening, and the force of the current must in that case be very considerable.

Moreover, the said construction of the terminal part of the pass admits of greatly augmenting the volume of water at the outlet. To this end has been constructed, from a point above the lowest of the falls (in Plate III., marked A), a subsidiary channel, provided with a sluice, through which a stream from the river may at any time be poured into the lower part of the pass, whereby its body of water can be increased to double the volume required to fill the upper part of the pass. The water from the subsidiary channel is gradually conveyed into the pass, the lower part of the former, which, throughout its entire extent, has the bottom pierced with parallel longitudinal openings, being given a position above the middle of the pass, into which therefore the water from the subsidiary channel successively streams. By means of this arrangement, both bodies of water are mingled without producing the slightest disturbance in the motion of the water in the pass, while giving to the lower part of the latter more of the character of rapids than would otherwise be the case.

It is obvious, that this peculiar construction of the lower part of

the pass must greatly enhance its attractiveness, and at the same time essentially contribute to provide an ample flow of water, be the height of the river what it may.

Also for the upper part of the pass, the remarkable difference occurring in the depth of the water has called for special contrivances.

About 27 metres below the upper extremity of the pass, where both walls of the channel consist of solid rock, has been erected a strong wooden dam, the upper surface of which lies higher than the highest flood water-line, which, at this point, extends 5 metres above the bottom of the pass.* The dam being provided with a gate, the required body of water can at any time be poured into the pass. Meanwhile, it is manifest that, without special contrivances, the pressure of the water during floods would render it impossible for salmon to pass through the gate, since the difference in the height of the water immediately above and immediately below the dam might be upwards of 3 metres. To equalize this pressure, a number of regulating barriers (5), each with the upper surface 0.4 metre lower than that preceding it,† have been erected across the channel blasted in the rock, the bottom of which, as previously stated, is nearly horizontal. Each of these regulating barriers has at the bottom an opening 0.63 square metre. The distance from barrier to barrier varies between 4.5 and 13 metres. By means of this arrangement, the surface of the water in each successive compartment formed by the said barriers lies a trifle lower than it does in the preceding one, and the difference in height can never exceed 0.4 metre. Hence, the pressure will not at any point—except at the gate of the main dam during the heaviest floods—be such as to impede in the slightest degree the passage of salmon through the openings in the various barriers or in the said dam.

Unless the river be exceptionally low, more water will pass through the openings in the regulating barriers than is required to fill the part of the pass constructed on Brackett's system. That the proper volume of water may at any time be conducted into this part of the pass, a strong wooden dam, provided with a gate, has been erected just below the last of the regulating barriers, or immediately above the point at which the wooden channel commences.

* Owing to the configuration of the ground, the water in flood-time does not rise so high at this point as it does at the upper extremity of the pass.

† The difference in height, however, between the upper surface of the main dam and that of the nearest regulating barrier is considerably greater; for, the heaviest floods being of rare occurrence, it is quite immaterial whether salmon at such times can pass through the inlet-gate. Besides, the force of the water at the foot of the falls is there so prodigious, that salmon probably do not venture so far up as the outlet of the pass.

The upper surface of the dam lies about 0.8 metre higher than does that of the outer wall of the pass, which here, immediately above the dam, is horizontal for about 5 metres. Thus is formed a by-wash, or overfall, which carries off the surplus water. Another by-wash, immediately below the dam, gives additional security. By this means, the proper body of water will flow through the pass whatever may be the height of the river, and without as a rule involving any adjustment whatever of the gates or sluices.

Plate VII. shows the upper part of the pass in perspective.

To insure the pass against damage during the heavy floods, two massive flood-proof walls have been erected, one of which closes the creek into which the pass disembogues, while the other extends from the bank of the river to a large rock just above the outlet. The latter wall also serves to bear part of the pass, whereby space is economized.

At the inlet, the bottom of the pass lies about 0.8 metre beneath the lowest water-line, so that even when the river is dryest a considerable body of water pours into the pass. True, this is of no account whatever as regards the ascent of the fish, which never, probably, will move when the river is so very low, but, for the conservation of the woodwork, a most important fact, the pass being thus prevented from ever becoming dry. Moreover, the depth at which the inlet has been placed admits of conducting a stream of water from the pass to the hatching-apparatus, which, with its present arrangement, affords space for about half a million of salmon fry.*

The volume of water in the pass is so regulated that a small quantity dashes over the stops, or transverse barriers. One advantage of this, is to agitate the surface of the water in the basins, which prevents the fish from being seen on its ascent of the pass, and therefore scared by people looking into the channel or by other surrounding objects.

As determined by measurement, the volume of water flowing through the pass amounts to 39 cubic metres a minute. This, however, does not include the volume — quite as large when wanted — that is poured through the subsidiary channel into the lower part of the pass. At the points in the pass where the velocity of the water is greatest (E and C, Plate V.), it reaches about 1.2 metres a second.

At the respective distances of 51, 111, and 172 metres from the outlet, resting-basins have been constructed for the salmon when ascending the pass. These basins vary somewhat in extent, the

* Another hatching-house, affording space for at least double the number of ova, is now (1883) in course of construction.

lowest being a trifle smaller and the uppermost basin a trifle larger than the middle one, which has a length and breadth of 4 metres and a depth of 1.75 metres. Their object is not precisely to afford the salmon an opportunity of resting, since at no point probably will the ascent of the pass be attended with any considerable exertion to the fish, and even if it were, they could rest in several of the compartments of the pass. The idea with these spacious resting-places is rather to induce in the salmon a sense of their moving through a large body of water, and thus preclude the impression which the pass might otherwise convey of being a small brook or rivulet. Moreover, these resting-basins afford a means of computing the number of fish that ascend the pass.

In Plate VI. is given a general view of the pass, with the grand scenery surrounding it, from which some notion may be formed of the great difficulties that have had to be overcome. It should be mentioned, however, that the lowest part of the pass cannot actually be seen from the point of view selected by the artist, shut out as it is by the beetling rocks through which the channel in part has had to be blasted. In order to give a general view of the entire pass, these rocks, therefore, are not shown by the artist.

The effectiveness of both salmon-passes has already stood the test of experience. Thus, on filling, for the first time, the pass at the Logsfos (summer of 1880) a considerable number of salmon were found to have made their ascent after the lapse of a few hours; and, since then, it has been, repeatedly ascertained that well-nigh all of the fish that find their way to the foot of the falls, very shortly after ascend the pass. A more successful result can hardly be imagined. The pass at the Rukanfos was not finished till the winter of 1880-1881; accordingly, after the end of the period, during which salmon are affected by their migratory instinct, and the fish that had ascended the Logsfos pass were of course stopped by the Rukanfos, at the foot of which a considerable number could be frequently observed, in a spot where the current and the nature of the bottom would admit of catching sight of them. Moreover, salmon were on several occasions seen to leap at the fall. The following season (summer of 1881) however, the pass at the Rukanfos was also found to answer its purpose, salmon having repeatedly been observed in the uppermost resting-basin of the pass, from which exit was for a short time cut off by means of an iron grating. On removing the grating, it was no longer possible to compute even approximately the number of fish that ascended the pass; but that by far the greater part of the salmon which ascended the Logsfos pass also made their way up the pass at the Rukanfos, may be safely concluded from the fact that but very few

salmon, and those solitary fish, could be discovered under the latter falls, while, as previously stated, salmon had abounded in that spot the autumn before, when the Rukanfos pass was still in course of construction. Besides, salmon have been observed and occasionally taken, by people fishing for trout in the reaches of the river above the Rukan Falls. Altogether, the project has turned out a great success.

The undertaking has been planned by the author of this paper, Mr. A. Landmark, Inspector of Fisheries, and Mr. G. Sætren, civil engineer, the former having pronounced on all points touching what may be termed its “piscitechnical” features, or whatever will presumably affect the ability and inclination of salmon to ascend the passes, while all technical questions of a general character, relating to solidity of structure, price of labor and materials, and so forth, have been decided by Mr. Sætren.

The cost of construction has been defrayed by a body of shareholders (The River Sire Salmon Fishery Company, Limited) who have bought up the fishing rights on the part of the river extending from the Lundevand to the sea, and those attached to the coast for a distance of 4 or 5 miles on either side of the mouth of the river.

The formation of the company is principally due to the exertions of Mr. B. Soyland, steamboat agent, who takes the greatest interest in everything connected with Norwegian salmon fisheries.

The money as yet expended, exclusive of the sum paid down for the purchase of fishing rights, &c., amounts to close upon £1,300. That the cost of constructing the passes has not been heavier must be ascribed partly to the favorable conditions under which the work was carried on — more particularly as regards the height of the water — but chiefly to the low rate of wages and cheapness of timber in that comparatively remote part of Norway.

A. LANDMARK.

CHRISTIANIA, April, 1882.

[E.]

NOTES ON THE EDIBLE QUALITIES OF GERMAN
CARP AND HINTS ABOUT COOKING THEM.

BY CHAS. W. SMILEY.

The introduction of carp into the United States is of so recent date that there has been, as yet, but little opportunity to grow them of sufficient size to eat, or to get a full expression from our people of their opinions of carp as food. The first distributions by the United States Fish Commission were in 1879 and 1880. Many of these fish were put into unsuitable places and perished. Many persons whose carp have survived have prized them so highly that they have persistently refused to allow any to be eaten. As, however, an occasional newspaper muttering has come to hand, it has been thought best to get together at once what information might be available.

About the first of July, 1883, a circular was prepared containing fifteen questions, covering the whole field of carp-culture. One of these questions was as follows: "Have you eaten carp? How were they cooked, and what was the opinion of their edible qualities?" This circular was sent out, July 20, 1883, by direction of Professor Baird, to all persons who appeared from the records of the United States Fish Commission to have received young carp in 1879 and in 1880.

There have been received thus far over 600 replies, and from these have been copied verbatim everything which correspondents have said with reference to this subject. Over 350 had not yet tasted carp.

Finding that there was an occasional remark of an uncomplimentary character, I inquired of Professor Baird with reference to publishing any adverse statements. In reply, he said: "Certainly it is not our policy to suppress honest criticism of the carp, and you are authorized to collate the testimony and publish both sides. NO FISH IS FIT TO BE EATEN DURING AND IMMEDIATELY AFTER THE SPAWNING SEASON. Unless criticisms have been made of the fish

during the late fall or early spring they do not affect the question." I have accordingly classified and will present herewith every scrap of testimony — good, bad and indifferent — which has been received in reply to these circulars, together with such incidental remarks as had previously reached the United States Fish Commission. Of these latter, there are not over half a dozen, and they are mostly indicated by an earlier date attached.

I have spoken thus definitely concerning this material because when treated with exact impartiality the opposition to the food qualities of carp dwindles down into such utter insignificance that some one might easily suspect me of culling the material. This point is especially to be guarded, because it is so often considered praiseworthy to suppress criticism which is prompted by ignorance of facts and which might unjustly injure a good cause. And I am very sure that every unfavorable opinion of carp herewith presented, except perhaps that of Mr. Epes, is based upon ignorance or forgetfulness of one of three facts :

I. No fish should be eaten during or immediately after the spawning time.

II. The muddy taste of any fish can be largely removed by keeping the fish alive in a tub of pure water, changing it daily for a week.

III. Bad cooking will spoil the best of food.

Reports upon the edible qualities of carp have been received from twenty-three States and Territories, as follows :

Table Showing the Number of each kind of Reports received from the various States and Territories.

STATE.	I. Fair to very good.	II. Emphatic praise.	III. Favorable comparisons with other fish.	IV. Sometimes soft or muddy.	V. Criticisms.	VI. Bones.	VII. Cooking.	Total.
Alabama,	1	3	1	-	-	-	1	6
Colorado,	-	-	1	-	-	-	-	1
Connecticut,	-	-	-	1	-	-	1	2
Georgia,	1	11	4	1	1	1	3	22
Illinois,	-	3	-	-	-	-	-	3
Indiana,	-	-	-	-	-	-	2	2
Kansas,	-	-	-	-	-	1	1	2
Kentucky,	-	6	-	-	3	1	3	13
Maryland,	6	21	16	4	2	-	7	56
Mississippi,	-	5	3	-	1	-	-	9
Missouri,	-	1	2	-	1	1	-	5
New Jersey,	1	-	-	1	1	1	-	4
New York,	2	1	-	1	-	-	2	6
North Carolina,	3	6	2	1	-	-	-	12
Ohio,	4	4	2	1	1	-	4	16
Pennsylvania,	2	2	1	2	-	-	2	9
Rhode Island,	-	1	-	-	-	-	-	1
South Carolina,	1	1	2	-	-	-	-	4
Tennessee,	4	5	3	2	-	1	1	16
Texas,	3	12	1	-	-	-	-	16
Utah,	-	-	-	-	-	-	1	1
Virginia,	7	14	1	4	-	1	1	28
West Virginia,	4	-	-	1	-	-	1	6
Canada, etc.,	1	-	-	-	-	-	1	2
Total,	40	96	39	19	10	7	31	242

For convenience of reference the testimonies are classified as follows :

	Numbers.
I. Moderate praise, from fair to very good, 1-40,	40
II. Unqualified praise and very emphatic expressions of approval, 41-136,	96
III. Comparisons with other fish, very generally complimentary, 137-175,	39
IV. Criticisms as to softness or muddy taste, 176-194,	19

	Numbers.
V. Indifferent and uncomplimentary reports aside from muddy taste and softness, 195-204,	10
VI. A few opinions in regard to bones, 205-211,	11
VII. Favorable reports, containing hints upon various ways of cooking carp, 212-242,	31
Total,	242

Of these 242 reports, 38 only contain the slightest reflection upon carp (Nos. 141, 144, 149, 151, 159, 166, 176-194, 195-204, 208, 209, 210). Many of these objections are declaredly slight. All but one (No. 194) of the criticisms have already been explained away, and I believe we possess the clew to that one.

1. MODERATE PRAISE — VERY FAIR TO VERY GOOD. — In this list are included 10 testimonies, entirely satisfactory in character; 21 of which, in speaking of the edible qualities of carp, pronounce them "good," 14 "very good," and 5 "fair," "very palatable," etc. These statements come from thirteen different States of the Union; but rather largely from Maryland, Virginia, West Virginia, Tennessee, and Ohio. Messrs. Wilmot (5), White (21), Peirce (22), and Duke (39) are men of very large experience with fish, and weight should attach to their testimonies. The method of cooking most frequently named is frying, though all methods are included in this group of statements.

2. UNEQUIVOCAL PRAISE AND VERY EMPHATIC EXPRESSIONS OF APPROVAL. — Under this head are grouped 96 different testimonies. Of these, 15 speak of carp as "very fine," and 21 as "excellent"; and others ring the changes on such expressions as "very good indeed" "first rate," "first class," "extra," "splendid," "very superior," "superb," "delicious," "the best of fish"; while quite a good many go on to say that carp are equal or superior to any other fish, or that they never ate anything more delicious. Such testimonies in so large number are, of course, very gratifying, although the Fish Commission has never pretended that carp would take as high a rank as many of these people have given it. These assurances come largely from Maryland, Virginia, Texas, Kentucky, and Mississippi — sixteen States in all. Among the writers are several men of distinction, such as State fish commissioners, editors, physicians, and farmers and planters of wide experience. In many cases the single testimony represents the opinions of whole families or neighborhoods.

3. COMPARISONS WITH OTHER FISH. — Some 39 correspondents have chosen to express their opinions by comparisons rather than in absolute terms; and here we have carp successively declared

equal to buffalo, mullet, suckers, mud-fish, croakers, mill-roach, perch, rock-fish, drum, bass, trout, sun-fish, red-horse, mackerel, red-snapper, and shad.* Of course the Commissioner, in bringing carp from Germany, did not for a moment suppose that he was introducing a fish equal in delicacy to trout, bass, or shad; but he has always claimed that its edible qualities were equal or superior to those of such fish as suckers, catfish, perch, buffalo, mullet, and sun-fish, and that by reason of its rapid growth, hardihood, and simple diet, it was more desirable for pond cultivation. Several of these replies (Nos. 100, 101, 140, 177, 186) indicate that scale carp are received more favorably than leather carp, while none speak of leather carp as superior to the scaled variety. In making these comparisons with other fish, all but six (Nos. 141, 144, 149, 151, 159, 166) place carp ahead of the fish with which they compare them. The reports cover the same wide range of territory as those in the preceding groups; here, as in the previous divisions, however, Maryland furnishing the larger number. The earliest distributions of carp were made to this State, probably on account of its proximity to Washington.

4. CRITICISMS AS TO SOFTNESS OR MUDDY TASTE. — Under this head are gathered 19 reports, a part of which speak of the carp as tasting muddy, and part alluding to their softness. Under other heads, No. 144 speaks of an "earthy taste," and Nos. 187 and 213 testify that soaking in salt water removed this taste. It may also be stated that removing the fish from a muddy pond, in which they would necessarily partake somewhat of the nature of their food, to a tank or tub of fresh water for a week, would very largely purify their systems. Carp is no exception to the rule that the flesh of animals will be affected by their food, but fish are exceptional in the ease with which this difficulty may be overcome. Many who have spoken of carp as being soft have betrayed their ignorance of the fact the flesh of all fish becomes soft and unsuitable for food during, and for a time after, spawning. Some of these correspondents have stated the time of the year when they ate their carp, thus conclusively proving this hypothesis. Particular attention is called, in this connection, to Nos. 39, 181, 190, 191, 192, 193. In regard to No. 194, it can only be said now that the water of the tank in which the gentleman kept his carp must

* Most of the fish with which carp have been compared unfavorably are carnivorous species. To raise these on meat is expensive. Carp are vegetable feeders, and adapted to districts where fish are scarce and so remote from the ocean that sea fish cannot be obtained, but where corn, cabbage, pumpkins, squashes, potatoes, etc., are abundant and cheap. The Commission does not offer nor commend carp to those who have access to the better sea fish, such as salmon, trout, whitefish, etc. Compared with vegetable feeders, there is no question of the great superiority of carp.

in some way have become contaminated and have imparted its injuriousness to the carp. It is intended, however, to make a special investigation of this case, to ascertain what the contamination consisted in. While some have spoken of the sweet taste of carp (Nos. 55, 139, 189, 222), only Mr. Epes has objected to them as "too sweet" or "sickening."

5. OTHER UNCOMPLIMENTARY REPORTS. — Of the 194 testimonies above considered, none have presented unexplainable objections except perhaps Mr. Epes. We now come to 10 testimonies, most of which are lacking in particulars, in which are used such expressions as "nothing extra," unfavorable," "very poor," and, in three cases, "unfit to eat." There is, however, nothing to contradict the supposition that these people tried their carp in the spawning season, in which, as has already been said, any fish is unfit to eat. The anonymous newspaper clipping, No. 204, well illustrates the exaggerations in which people sometimes indulge when they know that they can conceal their names.

6. THE BONES. — Most people have given up the ridiculous hunt for a fish without bones; but, while four (Nos. 141, 208, 209, 210) have found more bones than they liked in the carp, six (Nos. 136, 185, 205, 206, 207, 213) found fewer bones than they expected.

7. HINTS UPON COOKING. — In 31 additional cases, correspondents, all praising the flavor of their carp, have added some suggestions as to the method of cooking. It is quite noteworthy that every person who has imparted some information about the proper methods of cooking has praised the carp. All methods of cooking have indorsements, but the large majority speak of frying. The number of times that different methods of cooking have been mentioned is as follows: Fried, 163; baked, 35; boiled, 20; broiled, 14; stewed, 5; a combination of boiling and baking, 2.

One (No. 91) advises frying the young and baking the old, and those who recommend baking usually speak of using large fish. The recipe in No. 242 is especially commended to those who would fry carp. The author of the wine method (No. 238), Mr. Blackford, will be recognized as one of the New York commissioners, and the retail fish-dealer of the Fulton Market.

I. — MODERATE PRAISES — FROM FAIR TO VERY GOOD.

1. FAIRLY GOOD. — I have eaten three mirror carp that unfortunately jumped out of a tub of water one night. Their edible quality was fairly good. They were fried in butter. — THEODOTUS GARLICK, *Bedford, O.*

2. FAIR. — Yes; fried; fair edible fish. — N. BLACKWELL, *Bartlett, Tenn.*

3. FAIR. — We have eaten them; they were fried, and of fair quality. — B. C. HINNANT, *Daingerfield, Tex.*

4. VERY PALATABLE. — Fried in bacon grease they are very palatable. — JOHN M. FERGUSON, *Alderson, W. Va.*

5. NOT INFERIOR. — As a table fish carp is not of an inferior quality by any means, and is largely consumed in the principal cities of Central Europe, as Vienna, Berlin, and Paris. — S. WILMOT, *New Castle, Ont.*

6. GOOD. — We ate four fried. They were good. — SOLOMON BYER, *Norton, Ohio.*

7. GOOD. — We have eaten a dozen or more, fried. All pronounce the fish good. — E. A. WELCH, *Catonsville, Md.*

8. GOOD. — Yes; they were cooked in water and eaten with butter sauce. The opinion of their edible qualities was a good one. — G. HILLJE, *Schulenburg, Tex.*

9. GOOD. — My family has, and said it was good. It was boiled. It was taken in hot weather in July. — E. B. WOODRUEF, *Morristown, N. J.*

10. GOOD. — I have. They were fried. The flavor was good. — Mrs. S. A. TEEL, *Kyle, Tex.*

11. GOOD. — They were cooked by a recipe from an English cook-book, and were good. — SAMUEL HOPKINS, *Highland, Md.*

12. GOOD. — Two. Fried in butter. Good. — LEWIS W. RUNNER, *Morgantown, W. Va.*

13. GOOD. — I have eaten but one, and was pleased with its flavor. — E. B. ISETT, *Spruce Creek, Pa.*

14. GOOD. — I ate the two caught a year ago last spring. Fried, they are good fish. — J. M. McADOO, *McEwen, Tenn.*

15. GOOD. — We have eaten but one, and that was fried. We think they are a good fish. — J. B. HAWXHURST, *Homowack, N. Y.*

16. GOOD. — We ate one fried, and pronounced it good. — S. P. McFALL, *Newton Falls, Ohio.*

17. GOOD. — Have eaten them boiled and fried, and think them a good fish. — WILLIAM SHIRLEY, *5 S. Calvert Street, Baltimore, Md.*

18. GOOD. — We have eaten three fried. Their quality was good. I like them well. — J. B. HAGER, *Board Tree, W. Va.*

19. GOOD. — Have eaten some fried, and found them good. — R. D. MILLER, *Farmville, Va.*

20. GOOD. — One; fried. Good. — ABNER T. HOLT, *Bolingbroke, Ga.*

21. GOOD. — One small scale carp, accidentally killed in drain-

ing the pond, was fried as a pan-fish, eaten in my family, and pronounced good. — C. S. WHITE, *Romney, W. Va.*

22. GOOD. — I have not yet tasted carp. I prize my large ones too highly to kill them. Several friends have tested their table qualities, and all pronounce them good. — MILTON P. PEIRCE, *Philadelphia, Pa.*

23. GOOD. — I heard my son say he ate one, and that it was good. — DAVID BOWMAN, *Timberville, Va.*

24. GOOD. — Have eaten one fried, and found it good. — SOLON M. BOWMAN, *Timberville, Va.*

25. GOOD. — I ate one last year; don't remember how it was cooked. The edible qualities were good. — A. F. WHITMAN, *Nashville, Tenn.*

26. GOOD. — I have eaten only one. It was stewed, and part of it was fried. I consider it a good fish. — JAS. A. PETERKIN, *Fort Motte, S. C.*

27. VERY GOOD. — Yes. In the winter of 1882-'83, the pond was drained by muskrats and the carp were killed. The older ones then weighed nearly 3 pounds. They were considered very good eating. — RUSH TAGGART, *Salem, Ohio.*

28. VERY GOOD. — Two; fried; very good. — WILLIAM I. DUNN, *Sepulga, Ala.*

29. VERY GOOD. — Yes; boiled, baked, and fried. The edible qualities were very good. — P. C. CARLTON, *Statesville, N. C.*

30. VERY GOOD. — Only one; very good. — DAVID FARLOW, *Level Plains, N. C.*

31. VERY GOOD. — Those taken we ate. They were fried, and considered very good. — A. J. MICHENER, *Colora, Md.*

32. VERY GOOD. — Yes; and consider them very good. We ate one yesterday, fried. — FREDERICK ZAHN, *Frizzellburgh, Md.*

33. VERY GOOD. — The one I caught was fried, and was thought very good. — R. WELBY CARTER, *Upperville, Va.*

34. VERY GOOD. — I had one fried, and considered it a very good fish. It weighed 2½ pounds. — J. W. PRICE, *Fincastle, Va.*

35. VERY GOOD. — I caught one last year weighing about one-half pound, which was cooked and thought very good by the family. — JAMES A. VAN BRUNT, *75 South Street, New York, N. Y.*

36. VERY GOOD. — I have eaten some, fried. I suppose they would eat better to some party who had not raised them. Others who have eaten them pronounce them very good. — FRANK W. GREEN, *Nashville, Tenn.*

37. VERY GOOD. — Fried. I thought they were very good. — WM. ARBAUGH, *Carrollton, Md.*

38. VERY GOOD.—We have eaten only two; fried in a pan. They were very good.—W. W. GRIER, *Charlotte N. C.*

39. VERY GOOD.—I ate one of about 1 pound weight in 1882, and another this spring. I thought them very good. This fall, after they have recovered from spawning, I will try another large one.—RICHARD T. W. DUKE, *Charlottesville, Va.*

40. GOOD AND VERY GOOD.—We have eaten one. It was fried in lard, and was pronounced good and very good.—MICHAEL SHANK, *Harrisonburg, Va.*

II. — UNQUALIFIED PRAISE AND VERY EMPHATIC EXPRESSIONS OF APPROVAL.

41. VERY GOOD, INDEED.—Yes; one was taken out May 17, 1883, a very fine fish. It weighed 7 pounds less 1 ounce, and measured 22 inches. It was baked, and pronounced very good, indeed, by all who ate of it.—JAMES BAYLISS, *Massillon, Ohio.*

42. VERY GOOD, INDEED.—Yes; fried. They are very good indeed.—W. B. CHAPMAN, *Macon, Ga.*

43. HIGHLY ESTEEMED.—I have not; but hear of some that have, and that they are highly esteemed.—SHOTWELL POWELL, *Keyville, Va.*

44. WELL PLEASED.—We ate one, baked, that got caught in the chute. We were well pleased with the edible qualities.—A. H. BAKER & Co., *Fairfield, Ill.*

45. HIGHLY PLEASED.—We ate two. They were fried. We were highly pleased.—LOWREY & BERRY, *Blue Mountain, Miss.*

46. GOOD AND RICH.—We broiled two, and found them of good flavor, fat and rich.—GEO. N. FALK, *Lenoir, N. C.*

47. JUICY AND GOOD.—We ate three fried, and all were well pleased. They were juicy and good.—W. N. REEVES, *Eufaula, Ala.*

48. RICH, JUICY, BUT NOT DELICATE.—I have eaten about 3 or 4 fried. It is a good pan-fish, rich and juicy, but flesh not delicate.—I. RANDOLPH MORDECAI, *Baltimore, Md.*

49. DELICATE, WHITE, AND VERY NICE.—They are solid, delicate white meat, and very nice. They were fried.—JNO. R. BROWN, *Woodstock, Md.*

50. VERY NICE.—I ate one fried that weighed about 8 pounds, and it was very nice.—THOS. LONGBOTHAM, *Wortham, Tex.*

51. VERY NICE.—We have cooked them two or three ways, and find that the larger ones are very nice.—O. A. GILMAN, *Paris, Ky.*

52. VERY NICE.—I ate two of them fried; they were very nice.—JOHN HEETER, *Hunting Hill, Md.*

53. VERY TOOTHsome.—Yes; fried; and pronounced as very

toothsome by all who had the pleasure of partaking of them. — JACOB G. HEILMAN, *Jonestown, Pa.*

54. VERY FINE BAKED ; GOOD FRIED. — I have eaten three that were caught while fishing with hook for other fish and wounded in the mouth. We baked one three-pounder. It was very fine ; flesh firm ; good favor. We fried one of $2\frac{1}{4}$ pounds. It was quite good. — JOHN G. KEITH, *Jackson, Tenn.*

55. VERY FINE, SWEET, AND RICH. — All report them very fine eating ; very fat, sweet, rich, and toothsome when fried. — H. C. LOOSE, *Hagerstown. Md.*

56. THE DUTCHMAN SAID IT WAS FINE. — The one who proposed my getting carp suggested that I bring it to him and let him serve it up, as he knew all about it, and that I should dine with him. I consented. The carp was eaten. I was not told when, but the Dutchman said it was fine. — P. S. CLARKE, *Hempstead, Tex.*

57. FINE. — Yes, sir ; and it was fine. It was fried. — J. N. THOMASON, *Paris, Tenn.*

58. FINE. — Have eaten them fried ; weight, 4 and 10 pounds. They were pronounced by all to be a fine fish for the table. — Mrs. A. B. WATTS, *Newton, Miss.*

59. VERY FINE. — Yes ; and very fine. They were fried. — W. H. SHIRLEY, *Harrisonville, Md.*

60. VERY FINE. — I ate two of them. I had them baked. Their edible qualities were very fine. — JAMES BUMGARDNER, Sr., *Greenville, Va.*

61. VERY FINE. — I have eaten them baked and broiled. They are a very fine food fish. — THOMAS HUGHLETT, *Easton, Md.*

62. VERY FINE. — My wife caught one with her hands while I was from home. She pronounced it very fine. She fried it in lard. — J. A. DULA, *Lenoir, N. C.*

63. VERY FINE. — I ate one ; baked it. The flavor was very fine. — C. W. ALEXANDER, *Charlotte, N. C.*

64. VERY FINE. — I have eaten several while some of my friends were participants. All pronounced them very fine cooked by frying in plenty of lard. — S. M. CLAYTON, *Cyrustown, Tenn.*

65. VERY FINE. — They are very fine. — WM. ELLIOTT, *Taylor, Tex.*

66. VERY FINE. — Persons who have eaten them cooked in the ordinary way (fried) say they are very fine. — C. J. WATSON, *Munfordville, Ky.*

67. VERY FINE. — I have not. Those of my neighbors who have pronounced them very fine, either fried or boiled. — T. M. HIPNER, *Mortonsville, Ky.*

68. VERY FINE. — In my absence one of the oldest was caught

with a hook. When landed the line parted, and the fish was injured so that it could not be returned to the pond. It was fried and pronounced by the family very fine.—JAS. G. FIELD, *Gordonsville, Va.*

69. VERY FINE.—I ate two of them and found them a fish of very fine quality, much better than I anticipated.—F. S. EVERIST, *Port Deposit, Md.*

70. VERY FINE.—I have eaten a few. They were fried as we usually fry other fish. I have found them very fine pan fish.—JOHN McFADDEN, *Sudlersville, Md.*

71. VERY FINE.—The few eaten were fried, and were very fine food—remarkably good.—CHRISTOPHER & ROBERTS, *Fairburn, Ga.*

72. VERY FINE.—What fish I have taken from my pond to eat I have had baked and have found them very fine eating.—I. C. PLANT, *Macon, Ga.*

73. VERY FINE INDEED.—We ate only two. These were fried, and we considered them very fine indeed, and only wished we could have more.—H. L. SPENCER, *Social Circle, Ga.*

74. NUMBER ONE.—Yes, they were fried, and were thought by different persons to be No. 1.—THOMAS R. TULLOSS, *Rock Hill, Tenn.*

75. FIRST RATE.—I have, fried; first rate.—LEWIS BARLOW, *Sykesville, Md.*

76. FIRST RATE.—I have tasted three of the oldest. They were fried, and the quality was first rate.—J. M. BROOKS, *Waterford, Miss.*

77. FIRST CLASS.—My neighbors and myself ate one, after frying it as we would any other fish, and all unite with me in pronouncing it a first-class table fish.—GEORGE M. EMACK, *Versailles, Ky.*

78. FIRST CLASS. Yes, fried. They are first class in every way.—J. A. LONG, *Yanceyville, N. C.*

79. FIRST CLASS.—Had one cooked. It was first class.—W. G. DELASHMUTT, *Martinsville, Ill.*

80. FIRST CLASS; WHITE AND FINE.—I caught two last year that weighed $5\frac{3}{4}$ lbs. We baked them, and regard them first class, either baked or fried. The flesh is of a white texture, and fine.—A. SHINKLE, *Covington, Ky.*

81. EXTRA.—We have caught and eaten some fried, and claim them extra in quality.—S. O. HAWKINS, *Bucks, Ohio.*

82. GOOD ENOUGH; EXCELLENT.—Yes, a great many, both fried baked. By our best judges carp is considered excellent. They

are good enough. On account of their rapid growth and size they are better for baking.—GREENE B. MOBLEY, *Eutaw, Ala.*

83. EXCELLENT.—Yes, fried. They were pronounced excellent by every one who tasted them.—ABRAM E. NULL, *Union Bridge, Md.*

84. EXCELLENT.—Yes, one that was caught. It was fried and considered excellent eating.—R. K. DABNEY, *Powhatan C. H., Va.*

85. EXCELLENT.—We have eaten one in April. It was pronounced by all a fish of excellent quality.—I. C. DONALDSON, *Gilbertsville, N. Y.*

86. EXCELLENT.—My partner ate one, and pronounced it excellent.—A. P. BROWN, *Jefferson, Tex.*

87. EXCELLENT.—We had them fried once; they were pronounced to be excellent.—J. W. SHIMWELL, *Prince Frederick, Md.*

88. EXCELLENT.—Four, fried. Taste excellent.—CHARLES SENSEMAN, *West Charleston, Ohio.*

89. EXCELLENT.—We ate two old fish and five young ones. Fried. Quality excellent.—GUSTIN HAVENS, *Lewis Center, Ohio.*

90. EXCELLENT.—Have eaten some and think them an excellent table fish.—HARRISON SUMNEROUR, *Warsaw, Ga.*

91. EXCELLENT.—Yes. Fried the young ones, and baked the old ones. Edible qualities were excellent.—W. M. THORNTON, *Lake, Miss.*

92. EXCELLENT.—One, fried, was excellent.—A. H. WILKINS, *Whitesborough, Tex.*

93. EXCELLENT.—Only one, which was fried. All who tasted it pronounced it excellent.—FRANCIS PRIDE, *Cedar Hill, Tenn.*

94. EXCELLENT.—In the summer of 1882, with hook and line, I caught three, one weighing $3\frac{1}{2}$ pounds, the other two $2\frac{1}{4}$ and $2\frac{1}{2}$ pounds, respectively. They were fried, and pronounced by the company to be "excellent."—JOSEPH LIGON, *Massie's Mills, Va.*

95. EXCELLENT.—Got surprised. Yes; broiled and they were excellent in flavor and consistency—much to my surprise.—R. EMORY, *M. D. Taylor, Md.*

96. EXCELLENT.—I have eaten carp in Europe frequently and found them an excellent pan-fish.—C. BOHN SLINGLUFF, *Towson, Md.*

97. EXCELLENT.—I have eaten none myself; but those caught in Hardware were said to be excellent.—fried and boiled.—HENRY M. PRINCE, *M. D., Scottsville, Va.*

98. EXCELLENT.—We had two cooked; one baked, the other fried. They were excellent.—EMANUEL HEYSER, *Madison, Ga.*

99. EXCELLENT; NOT GAMY NOR FISHY.—Yes, one. Baked and stuffed. The meat was white and of the consistency of shad. It

had no game taste whatever and none of the fish taste. With condiments and being well cooked, all pronounced the dish excellent.—W. M. E. SMITH, *Albany, Ga.*

100. SCALE CARP EXCELLENT.—Ate several fried. The scale carp I consider excellent. The leather carp not so good.—H. B. DAVIS, *Macon, Ga.*

101. EXCELLENT; SCALE CARP THE BEST.—I have eaten one of each variety and much prefer the scale carp to the leather. They were boiled, and considered excellent.—A. W. OVERTON, *Frankfort, Ky.*

102. MOST EXCELLENT.—Have eaten one—fried it. Think it a most excellent table fish.—C. C. DAVID, *Harmony Grove, Ga.*

103. MOST EXCELLENT.—Mayor T. J. Jarratt had one of the carp baked and it was pronounced by himself and other members of the family and also by Capt. E. A. Goodwin, who was invited to partake of it, as a most excellent fish. Mr. Coleman, the keeper of the Central Park, also speaks of it as very palatable.—*Petersburgh, Va., Index-Appeal, August 12, 1882.*

104. SPLENDID; NONE BETTER.—We have eaten some. We had them fried, and thought they were splendid. I don't think there could be any better fish.—JAMES W. OGLE, *Union Bridge, Md.*

105. SIMPLY SPLENDID.—Fried, and simply splendid.—M. S. GILMER, *Mathews, Ala.*

106. VERY SUPERIOR.—They are cooked according to fancy as other varieties, and are very superior in flavor. As a baking fish, they are very superior.—L. T. WHEELER, *Corsicana, Tex.*

107. SUPERB.—We ate one, which was superb.—PETER BONDS, *Harrisonburg Va.*

108. SUPERIOR.—We have eaten a few of them and consider them a good eating fish. They were cooked the same as shad—fried. We look upon them as a superior fish.—JAMES HARBAN, *Dayton, Md.*

109. DELICIOUS.—Only once. They were fried in the usual way and were pronounced very palatable and delicious.—DANIEL WOLF, *Fairplay, Md.*

110. DELICIOUS.—Yes. They were fried and were delicious.—THOMAS V. RICHARDSON, *Phoenix, Md.*

111. DELICIOUS.—Fried; they were delicious.—J. M. WALLER, *Mexia, Tex.*

112. DELICIOUS.—Only one, weighing $3\frac{3}{8}$ lbs., which was fried, and my family pronounced it delicious.—SAMUEL ANDERSON, *Rutland, Md.*

113. DELICIOUS. — Only upon one occasion, and fried. It was delicious. — J. W. DOWNEY, M. D., *Newmarket, Md.*

114. GOOD AS HE WANTS. — I have eaten 2 of the first lot merely to try them. The quality was as good as I want. They were only fried. — M. B. E. KLINE, *Broadway Depot, Va.*

115. FINE AS EVER TASTED. — I have eaten one and had it fried. It was as fine a flavored fish as I ever tasted. — W. K. HUNTER, *Rolesville, N. C.*

116. OILY, AND FINEST FISH HE EVER ATE. — We have eaten nine and given away three. We fried them like other fish. They contained nearly oil enough to cook themselves and were very fine — finest I ever ate. — HENRY PULSE, *Harrisonburg, Va.*

117. NEVER ATE BETTER FISH. — One killed through a mistake was fried, and we never ate a better fish. — ROBT. H. RICKS, *Rocky Mount, N. C.*

118. NEVER ATE BETTER FISH. — Have had them fried and don't think I ever ate any better fish in my life. — MRS. M. A WALLACE, *Sherman, Tex.*

119. NEVER ATE BETTER FISH. — Have fried them, and never ate better fish. — WM. O. YAGER, *Luray, Va.*

120. BETTER THAN ANY OTHER FISH. — I have had three messes ; one last year, and two since. They were fried. They eat very well — better than any other fish in the country. — J. T. LOW, *Saulsbery, Tenn.*

121. VERY BEST. — We eat two large ones. They were broiled. The quality was of the very best. — DR. SAMUEL HAPE, *Hapeville and Atlanta, Ga.*

122. BEST OF FISH. — I have eat 5 or 6 weighing from 1 to 1½ lbs. each. We fried them in butter, and all who have partaken of them have pronounced them the best of fish. — MICHAEL WILLAX, *Baltimore, Md.*

123. BEST THEY EVER ATE. — We have eaten one which was fried. It was decidedly the best we ever ate. This was testified to by several. — JOHN C. WENGER, *Dayton, Va.*

124. BEST FISH HE EVER ATE. — Yes, they were broiled and were very nice — the best either of salt or fresh-water fish that I have ever eaten. — H. G. SANFORD, *Warren, R. I.*

125. BEST FISH THEY EVER DID EAT. — Yes, we used them all last summer, and gave a mess to all our friends and neighbors. All with one voice say they are the best fish they ever did eat, and we say so too. Cook them as you please. They are good enough for any man. — SAMUEL McCLELLAND, *Salt Springs, Mo.*

126. NEVER ATE A SUPERIOR FISH. — In draining my ponds last year I caught a carp 18 inches long and had it fried. I

never ate a superior fish. My family pronounced it excellent. — E. G. PEYTON, *Hazlehurst, Miss.*

127. SUPERIOR TO ANY OTHER FISH THERE. — We have eaten two, which were fried. They were delightful and have superior qualities over any other fish here. — WM. L. HUDSON, *Luray, Va.*

128. FAR SUPERIOR TO ANY TEXAS FISH. — Yes, stewed and fried. They were splendid both ways, far superior to any Texas fish, in our estimation. — WILLIAM BRUEGGERHOFF, *Austin, Tex.*

129. GOOD AS ANY. — We have baked them and they are as good as any fish we ever ate. — J. SHAW MARGERUM, *Washington, Pa.*

130. EQUAL TO ANY FISH. — I have eaten some. They were fried and were an excellent table fish; equal to any species of fish. — WM. A. JETT, *Atlanta, Ga.*

131. EQUAL TO ANY FISH IN THE COUNTRY. — I have not, but several of my neighbors have and pronounce them equal to any fish in the country. — MONROE POINTER, *Como Depot, Ill.*

132. NICEST FISH EVER TASTED. — They are the nicest fish I ever tasted. We fried them the same as other fish. — WM. A. RIDGELY, *Glenwood, Md.*

133. FINEST FISH IN THE COUNTRY. — Have eaten none here, but plenty in Germany, and know it is the finest fish we have in our country. — WILLIAM RADAM, *Austin, Tex.*

134. NEVER ATE ANYTHING MORE DELICIOUS. — We ate the one 8 inches long, cooked with fine lard. I had visitors, and all joined in saying they never had eaten anything more delicious. I know I never will. — JOHN HOUSTON, *Farmville, Va.*

135. MOST EXCELLENT FISH THEY EVER ATE. — I killed a dozen. My family and neighbors had them fried, and all pronounced them the most excellent of any fish they ever saw. — E. C. DICKINSON, *Rusk, Tex.*

136. A CRUCIAL TEST WITH MAGNIFICENT RESULTS. — Eight out of ten men with whom we have ever conversed about the table qualities of the German carp have affirmed that the fish was unsurpassable as an article of diet, but every now and then there comes along a ninth and tenth man who pronounces it coarse, dry, and not fit to eat. Our mind being thus unsettled on this great subject — and the present absorbing public interest in the carp culture demanding a dissipation of all doubts — we addressed a note to our old friend, Capt. A. D. Bates, of Batesburg, the pioneer of carp-raising in our county, begging that he allow us to spend a day with him and test the qualities of the carp. His reply was, "Come any day you please. Bring whomsoever you please. I shall be delighted, and you shall eat fried carp three times a day."

As regards the carp at dinner, it was in this wise: There were two dishes of them, 7 or 8 on each dish, fried. All these were in size from one to two pounds. They were fried as shad are. And certainly — and in all honesty and sincerity — we have never tasted a more delicious fish. So far from being dry, they are precisely the opposite; though as they grow older, the flesh becomes more solid. They have but few bones; the backbone and ribs, with but few besides. As we ate of the fish, the thought occurred to us that perhaps there was more in the cooking than in the fish. We intimated this thought to Mrs. Bates, who laughingly assured us that the frying process was of the very simplest, and that the fish were standing emphatically upon their own merits. In conclusion, we beg to say that if our personal and individual experience of the table qualities of the German carp will be any encouragement to them in carp-raising, we again affirm, without fear of successful contradiction, that the carp is an exceedingly delicious fish, and well worthy of any pains that may be bestowed upon it. — JAS. T. BACON and THOS. J. ADAMS, *Editors of the Edgefield Advertiser, Edgefield, S. C., March 29, 1883.*

III. — COMPARISONS WITH OTHER FISH — VERY GENERALLY COMPLIMENTARY.

137. GOOD; EQUAL TO BUFFALO. — Have eaten several that were fried. We consider their edible qualities good — equal to the buffalo in the Ohio River. — MATTHEW B. CARTER, *Shaker, Ohio.*

138. EQUAL TO BUFFALO. — We ate one, fried, which got caught in the ice and was killed. It was about as good as a buffalo, though if it had been fresh perhaps it would have been better. — G. W. VARNUM, *Montgomery City, Mo.*

139. EQUAL TO MULLET. — I have eaten 140 fried. I found them something like the mullet. They are very nice, and sweeter than any other fish. Rather too sweet for some. — CHARLES J. RIDDLE, *Fork, Md.*

140. EQUAL TO BRANCH MULLET, OR SUCKERS. — Scale carp, first rate in quality. Leather carp, not so good, being more like the branch mullet or sucker. — BENJAMIN D. PALMER, *Sandy Spring, Md.*

141. EQUAL TO SUCKERS. — I have eaten only one. It was fried. I think it is about equal to our common sucker — fully as bony. — G. M. GALLASPY, *Decatur, Miss.*

142. EQUAL TO CATFISH. — A few days ago we ate two of the last lot, fried. They compared very well with ordinary fish — something similar to catfish. — P. PEYTON CARVER, *Mount Juliet, Tenn.*

143. EQUAL TO OTHER POND FISH. — Have not given them a fair trial, but think them equal to other lake fish. — I. A. EDMONDSON, *48 South Calvert Street, Baltimore, Md.*

144. EQUAL TO CROAKERS, MILL-ROACH, AND MUD-SHAD. — I have eaten some fried. I did not think they rated above croakers, mill-roach, or mud-shad. They had an earthy taste. I have never eaten them any other way than fried. — ANDREW REESE, *Lutherville, Md.*

145. EQUAL TO PERCH. — They eat very much like the perch that is found in our creeks and rivers. — JAMES T. BARTLET, *Trappe, Md.*

146. EQUAL TO PERCH. — Yes, they were fried, and I thought them equal to our salt water perch, which are good. — F. I. WILEY, *Charlotte Hall, Saint Mary's County, Maryland.*

147. EQUAL TO PERCH. — We have eaten some. They were fried, and the flesh tasted similar to that of a perch. — GEORGE R. PARROTT, *Still Pond, Md.*

148. EQUAL TO ROCK FISH. — We have fried 12 or 15 of them and found them equal to pan rock. — JAMES BURTON, *Greenwood, Md.*

149. EQUAL TO DRUM BUT NOT TO PERCH OR BASS. — Yes, three. Two were fried and one boiled. They were eaten in the winter, and opinion was expressed that they were a good coarse fish, about equal to drum, inferior to perch or bass. — WILLIAM L. YOUNG, *Waverly, Miss.*

150. NOT EQUAL TO BASS. — Yes, very fair. They are not as good as bass. The flesh has not much flavor and is soft. — M. GILLET GILL, *Baltimore, Md.*

151. NOT EQUAL TO THE RIVER FISHES. — In April, 1882, I tasted of a baked carp weighing some 5 pounds, properly seasoned and cooked. I think it inferior to any of our running stream fishes for the table in flavor and texture. — IRA P. JONES, *Nashville, Tenn.*

152. QUITE SUPERIOR TO NATIVE FISH. — I have eaten two messes. They were fried and very fine; quite superior to our common fish. — J. C. KEITHLEY, *Shackleford, Saline County, Missouri.*

153. BETTER THAN PERCH OR CATFISH; NOT EQUAL TO BASS OR TROUT. — In June, 1882, I caught several estimated at one and a half pounds. All were returned to the water except two, which were baked and eaten. They were considered as "good"; not so good as bass or mountain trout, but better than perch or catfish. — MATTHEW A. MILLER, *Richmond, Va.*

154. NOT EQUAL TO TROUT OR SHAD. — Yes, I had some prepared

as fish generally are. My opinion is that they are the fish for the people, but not so good as the trout or shad. — C. M. COE, *Atlanta, Ga.*

155. NOT EQUAL TO TROUT. — I have eaten carp from another's pond. I liked them pretty well — not so well as trout. They were fried. — PEMBERTON WOOD, *Union Bridge, Md.*

156. NOT EQUAL TO TROUT OR PERCH. — I commenced in 1882, and have been eating on them ever since. I am getting old and could not wait any longer. We fry and stew them. They are very good, either way — not equal to the trout or perch. — M. S. FINCH, Sr., *Wortham, Tex.*

157. NEXT TO TROUT AND PERCH. — Good; only surpassed by our native trout and perch. — E. L. McGEHEE, *Woodville, Miss.*

158. BETTER THAN SUNFISH OR TROUT. — Fried, and better than the sunfish. I prefer them to the mountain trout from my pond near by or to my eastern trout bred here. — ADDISON BAKER, *Denver City, Colo.*

159. BETTER THAN RED-HORSE — NOT EQUAL TO BREAM. — One only — of the scaly variety. It was fried and pronounced fine — not equal to the bream, but better than red-horse, which it resembles. — S. W. BOOKHART, M.D., *Blythewood, S. C.*

160. EQUAL TO SHAD, RED-HORSE, BLACK BASS, OR SUCKERS. — They are equal to the shad, red-horse, black bass, white sucker, and other fish we get here. — ABEL A. WRIGHT, *Griffin, Ga.*

161. EQUAL TO ANY NATIVE FISHES. — Yes, fried. They are equal to any of our native fishes. — H. I. IRLY, *Eufaula, Ala.*

162. EQUAL TO BLACK BASS. — I think they are as good as black bass. — WM. DOWNEY, *New Market, Md.*

163. BETTER THAN BLACK BASS, ROCK OR MACKEREL — EQUAL TO SHAD. — We have, fried. We consider them equal to shad, superior to black bass, rock or mackerel, and we wish for nothing better. They are the fish for the million. — EDWIN H. REYNOLDS, *Rising Sun, Md.*

164. EQUAL TO BASS OR PERCH — SUPERIOR TO LAKE FISH. — The first one was caught about September 1, which we did not expect to be extra on account of the warm weather, but to our surprise it was excellent, and by one guest who is used to eating fish caught fresh from Lake Michigan and from different streams of this State, it was pronounced equal to the creek bass or perch, as it is sometimes called, which is considered the best fish we have, even superior to lake fish. We all thought it far better than catfish or suckers. It was not oily or coarse, as some papers have stated. Three persons besides our own family of four grown persons partook of it, and all liked it. The other fish was caught in October, after the weather

became cooler, and four people, all different from the first party, besides our family, ate of it, the same opinion being expressed as before. We who ate of both could see no difference, unless it was a very little more firmness to the flesh of the last. — GUSTIN HAVENS, *Lewis Centre, Ohio, April 6, 1883.*

165. NEARLY EQUAL TO RED SNAPPER. — Have eaten no carp under 2 pounds, at which weight they are an excellent pan fish, only the flesh is a little soft. An eight-pounder baked is nearly as good as a red snapper. — B. J. WILSON, *Atlanta, Ga.*

166. NOT EQUAL TO SHAD. — Yes, and I do not consider them first class for eating. They will not compare with shad and other fine fish in North Carolina waters. — H. B. WRIGHT, *Saulsbury, Tenn.*

167. NOT EQUAL TO SHAD. — Yes; they were fried as we cook herring and their quality was fair, but not so good as Potomac shad. — ASA M. STABLER, *Spencerville, Md.*

168. EQUAL TO SHAD. — We ate one this morning. It was broiled. It was very good — something like shad. — WM. THOMPSON, JR., *Lemont, Pa.*

169. EQUAL TO SHAD. — I have. They are first rate, about equal to boiled shad. — SAMUEL T. EARLE, *Centreville, Md.*

170. EQUAL TO SHAD. — Yes, fried; most excellent, equal to shad. — IRA A. FITZ GERALD, *Linwood, N. C.*

171. EQUAL TO SHAD. — I cooked four during last year. They were fried as we usually prepare shad, and I consider them equal to shad. — RICHARD H. CORNEGYS, *Greensborough, Md.*

172. EQUAL TO TROUT OR SHAD. — Yes, baked and fried, fresh from the water. It was equal to trout, and I think equal to shad. — DR. H. H. CARY, *La Grange, Ga.*

173. BETTER THAN SHAD. — We have eaten two fried and consider them better than shad. — WM. B. TEWELL, *Rockhill, S. C.*

174. BETTER THAN SHAD. — Yes, baked; superior to shad. — H. G. EVANS, *Hendersonville, N. C.*

175. BETTER THAN SHAD. — Two, baked. I found them an excellent table fish — in my estimation far superior to shad. — ADOLPH J. GALL, *Jessup's, Md.*

IV. CRITICISMS AS TO SOFTNESS OR MUDDY TASTE.

176. GOOD, BUT A LITTLE SOFT. — We have eaten some few fried. They were good. Little on the soft order. — JOS. HAYGHE, *Upper Cross Roads, Md.*

177. SOFT. — The scale carp are best. The others are too fat and soft. — SAMUEL M. SUBERS, *Macon, Ga.*

178. SOFT. — We ate two, fried in butter. They were pleas-

ant tasted, but the flesh was most too tender. — J. W. HIGBEE, *Castle Shannon, Pa.*

179. EXCELLENT, PERHAPS SOFT. — I ate two fried. Their table qualities were excellent. The first one was a little too fat and the meat a little soft. — C. C. LOBINGIER, *Braddock, Pa.*

180. TOO SOFT. — I do not think them a good pan fish, being too soft. They are good boiled. — ROBERT E. WITHERS, *Wytheville, Va.*

181. SOFT AND OF A MUDDY TASTE IN JULY. — Cooked in lard. I did not like them. I found them to be soft and strong in flavor. I think it was July 8th that I tasted them. — WM. SALWAY, *Superintendent of Spring Grove Cemetery, Station A, Cincinnati, Ohio.*

182. SOFT AND OF A MUDDY TASTE. — I have eaten them fried several times. I do not like them very much. They are soft and taste a little muddy. — SAMUEL ROOP, *Westminister, Md.*

183. MUDDY TASTE. — I tried to eat a 3-pound scale carp, but found it strong, with a disagreeable, muddy flavor. We fried and served it with spiced sauce. Some of mine are the leather variety, and perhaps they may prove better. — THOMAS CLAPHAM, *Roslyn, N. Y.*

184. A LITTLE MUDDY TASTE. — I have eaten some fried in lard that was fat, very good except a little musty taste. — ANDREW MANN, *Forest Hill, W. Va.*

185. MUDDY TASTE DUE TO POND. — The Albright mill pond was drawn off yesterday and Mr. J. E. McKnight gave us a small carp which we had cooked. The flesh was white and rather soft. The fish does not have many bones; but this one was not of fine flavor, having a muddy taste. This, however, may be owing to the character of the pond, which is a very old one, filled with red mud, and very offensive. — *The Daily Bugle, Jas. W. Albright, Editor, Greenboro, N. C., May 2, 1883.*

186. CAUSE OF MUDDY TASTE. — I have eaten them, both fried and broiled. I think the scale carp superior to the leather, but the quality of the carp depends upon their food. If left to care for themselves they will taste of the mud. — L. TRIPLETT, Jr., *Mount Jackson, Va.*

187. HOW TO AVOID MUDDY TASTE. — We ate a few last spring, fried. They tasted of mud unless they were first soaked in salt water. After being soaked over night they were very good. The meat is firm. What I used were scale carp. — CAPT. JNO. T. FLETCHALL, *Poolesville, Md.*

188. SOME NOT GOOD, AND SOME VERY GOOD. — I ate three carp which weighed two pounds each. They were fried and I did not think much of them. The flesh was not very solid and had a

sweet taste. Those eaten were in April before they had spawned, and while I and some of my family did not like them, one of my neighbors, to whom I sent one, thought it very nice. These fish were some of the original lot received from you. I have this last week eaten some of the two-year olds, weighing $\frac{1}{4}$ pound each, and all liked them very much. — E. L. TSCHIFFELY, *Hunting Hill, Md.*

189. SOFT IN JUNE. — We baked a 3-pound one taken from a very small and warm pond. We found it of good flavor, and sweet, but very soft. It was killed late in June, and was full of roe. — LEONARD V. GREEN, *Norwich, Conn.*

190. NOT GOOD WHEN SPAWNING; OTHERWISE VERY FINE. — Only one, but about spawning season. It was strong tasted. I am assured, however, that they are very fine at other seasons, and even then if too young to spawn. — J. W. MEWBORN, *Macon, Tenn.*

191. NOT GOOD IN AUGUST; SMALL ONES VERY FAIR. — We have tried one weighing 10 pounds, and gave away others about that size. They were stuffed and baked. I think they are the poorest food-fish ever eaten. Even the smell is offensive. July 25, 1883.

The large carp I wrote about as being so offensive when cooked was served up in the month of August.

The small carp, say $\frac{1}{2}$ pound to $1\frac{1}{2}$ pounds, we catch with worms at the present time. The parties who have eaten them say they think them a very fair pan fish. — WILLIAM GRISWOLD, *Jobstown, N. J., July 30, 1883.*

192. RESULTS OF EATING CARP SOON AFTER SPAWNING TIME. — It must be remembered that the taste of mankind is so different that what would delight one would disgust another. We had a carp boiled by a German, but none of our party liked it thus cooked. The next was stuffed splendidly and baked. This was found more palatable. As a pan fish we must say that those fortunate people who know how a 13-inch freckle, such as you catch in Surrey and Sussex Counties, tastes will not take any stock in this new comer. But my opinion is that on a cold, frosty morning in October the carp will be found to be good eating, if properly cooked. — R. A. MARTIN, in the *Petersburgh, Va., Index Appeal*, Aug. 12, 1882.

193. DO NOT EAT CARP IN SPAWNING SEASON. — Last November one gentleman got a carp 20 inches long, and all who ate of it said it was O. K. Two others tried one, each in spawning season, and said they were not good. Of course these persons knew nothing of carp culture. — S. J. ALEXANDER, *Macon, Tenn. July 3, 1883.*

194. INFERIOR AND SICKENING AFTER TWO WEEKS' CONFINEMENT IN A RAILROAD TANK. — It was in the months of December and February that I tasted the carp. On one occasion I caught four out of my pond and put them in a railroad tank containing some 5,000 gallons of water which was changing every day or so. I put them in there, not for the purpose of changing their condition or edible qualities, but I was expecting a friend who was thinking of getting some, and I wanted him to taste them. I put them in the tank so that I could take a net and get them at any minute. But my friend did not come at the time I expected him and the carp *remained in the tank over two weeks*, being fed in the meantime on bread alone. This tank is a large wooden tub containing over 5,000 gallons of water. I served the carp in three different ways for the table, and in all the different ways it still retained its muddy, strong, fishy, sweet, sickening taste. Three out of four who ate any complained of a little sickness at the stomach after eating them. After trying myself I sent a half dozen or more to friends in the village, and every one who ate them said it had the same taste to them as above. I must say I think it the most inferior fish I ever ate. I tried hard to see if I could not overcome some of my bad opinions of the fish, as I had gone to the expense of fitting up a nice pond especially for them, but facts are stubborn things. I am now stocking my pond with black bass in order that they may eat up the young carp, as I think them worthless for anything else. — COPELAND D. EPES, *Nottoway C. H., Va.*

V. — THE ONLY UNCOMPLIMENTARY REPORTS ASIDE FROM THOSE KNOWN TO BE DUE TO EATING CARP IN THE WRONG SEASON.

195. RATHER INDIFFERENT. — Have eaten several fried and considered them rather indifferent. — ROBERT M. STABLER, *Spencerville, Md.*

196. NOTHING EXTRA. — I ate two of them; I thought them nothing extra. — J. L. WOOLFOLK, *Madisonville, Ky.*

197. OPINIONS DIFFER. — Have eaten a number of them; most of persons pronounce them fine, others differ. — W. W. TUNIS & BRO., *Tunis Mills, Md.*

198. COULD NOT TELL. — We have fried and eaten two of the fish that we found in the grass with some hook holes through their mouths. Thieves had dropped them. We could not tell much about the quality. — JOHN B. BROWN, *Nashville, Ohio.*

199. UNFAVORABLE. — Opinion not in favor of carp. — JOHN COLLINS, *Bernardsville, N. J.*

200. VERY POOR. — I have. They were fried in hogs' lard.

Their edible qualities were very poor. — JOSIAH PERRY, *Covington, Ga.*

201. DOES NOT LIKE THEM AT ALL. — We have eaten them several times, always fried in butter or lard, after being rolled in meal. I do not like them at all. — OSCAR REID, *Ferguson, Mo.*

202. UNFIT TO EAT. — Have eaten one and pronounced it decidedly unfit for table use. — R. PAYNE, *Georgetown, Ky.*

203. WORTHLESS FOR EATING. — Yes, have eaten a few, baked, fried, and broiled. Their edible qualities are not good. I was very much disappointed in them. They are worthless for eating. I think it very likely that the muddy bottom of the pond causes the fish to be so indifferent for eating. — E. F. RAWORTH, *Vicksburg, Miss.*

204. TOUGH AND UNFIT TO EAT. — Our country is getting pretty thoroughly stocked with German carp, and there is hardly a paper in the land but teems with praises of their wonderful growth, loveliness, adaptability to the shallow ponds, &c., all of which we most unqualifiedly indorse; but how seldom do we hear one word as to their eating qualities. Although our esteemed senator from this district, who introduced them here three years ago, tells us they sell "side by side" with the best fish in the Washington, D. C., market, still that does not keep other Kentuckians, at least, from having their tastes. From fifteen to twenty families around here have tried them at different times during the past year, and, except two persons who could eat them but did n't relish them, they unhesitatingly pronounced them unfit to eat. They have tried them boiled, baked, and fried, and discarded them every way. One lady says, they are well named leather carp, for we would prefer leather served in any style, to them; and, right here, might not our fish commissioners have mistaken their use, and ought we not to send a few to the tannery? Another person says he intends to keep raising them, for he knows they will prove valuable for soap grease. Such are some of their indorsements here, and we would like for others throughout the country not to think so much of them as we did, having them nearly three years before trying them, but to try them as soon as possible, and report the results. — *An anonymous Kentucky correspondent of the American Field, January 20, 1883.*

VI. — A FEW OPINIONS IN REGARD TO THE BONES.

205. VERY FREE FROM BONES. — Very much like Lake Michigan white-fish; bony at the back of the head, like shad. The remainder is very free from bones. — E. MILLER, *Mahwah, N. J.*

206. VERY FEW BONES.—Fried, it was very good; very few bones.—T. HOLT, *Holt's Summit, Mo.*

207. FINE FLAVOR, NO BONES, AND FAT.—Yes; dam broke, and those injured in catching were baked and fried. They were of fine flavor, fat, and no bones.—ED. M. GRESHAM, *Carlton's Store, Va.*

208. GOOD BUT BONY.—Yes; a good number fried and boiled. They are pronounced by all as good as any fish, excepting a few more bones than we usually find in other fish.—M. S. O'NEAL and C. G. ARNOLD, *Versailles, Ky.*

209. BONY, LIKE BUFFALO.—I dissected two or three and I found those detached bones that make the buffalo (Western Cyprinidæ) thick-lip so objectionable. Otherwise it is a good fish in August and September. After that they get soft, and continue to be so till after they have spawned in June.—E. Z. BUTCHER, *Solomon City, Kan.*

210. BONES IN SMALL ONES.—Yes. Fine baking fish. Small ones are rather too bony for frying, perhaps.—E. A. LINDSEY, *Jackson, Tenn.*

211. NOT FULL OF BONES NOR MUDDY.—Carp are not full of bones and do not taste of mud, as some would have us think, but, on the contrary, are very free from small bones and are a most excellent table fish, to which several who have dined with me will testify.—H. B. DAVIS, *Macon, Ga.*

VII.—HINTS UPON VARIOUS WAYS OF COOKING CARP BY OTHER ADMIRERS OF THIS FISH.

212. FRIED BROWN: FIRST RATE.—Yes; we have tried them three times. We scald them the same as catfish, roll them in meal, and fry them brown. We think they are first rate; good as we want.—A. J. and W. B. BAIRD, *Nashville, Tenn.*

213. SALTED TO REMOVE MUDDY TASTE; THEN FRIED.—They tasted of mud unless they were first soaked in salt water over night. Then fried they were very good.—Capt. JOHN T. FLETCHALL, *Poolesville, Md.*

214. SALTED AND FRIED BROWN: EXCELLENT.—We took one out of pond No. 2, in May, 1883, weighing three pounds. When scaled, salted five hours, floured, and fried brown, it was of excellent flavor.—J. W. LONG, *Mount Morris, Pa.*

215. FRIED BROWN: VERY SUPERIOR.—I have eaten one. I pronounce it splendid. It is a very superior fish when well cooked and fried brown, as a fish ought to be.—EDWARD THOMPSON, *Saint Johnland, N. Y.*

216. BEST WHEN FRIED BROWN.—Some 25 or 30 persons in this

vicinity have eaten them and generally pronounced them good enough. I ate two that were boiled and did not like them so well as fried and well browned. They are drier and suit my taste better. — W. E. LOGAN, *Andrews, Ohio*.

217. SPLIT AND FRIED: EXCELLENT. — We have tasted of the large size, and of the largest size of young ones. We had them fried. The large size were split before frying, and pronounced by my family and friends that helped to eat them excellent. — BENJAMIN G. CISSEL, *Highland, Md.*

218. SPLIT AND FRIED: NEVER ATE BETTER. — I have. The 1 to 2 pounds carp were split open and fried, and the opinion of every one is that they never ate better fish. Mine are of the scaly variety. — P. G. POWELL, *Versailles, Ky.*

219. FRIED IN BUTTER: NICE. — We have eaten one; cleaned it in the evening, salted it, and fried it in butter; thought it good and nice. — WM. SADLER, *New Salem, W. Va.*

220. FRIED IN BUTTER AND LARD. — Of the very finest. One, which was rolled in wheat flour and fried in butter and lard. Their eatable qualities were of the very finest. — BENJAMIN L. GARBER, *Marietta, Pa.*

221. FRIED IN LARD: EXCEEDINGLY GOOD. — Last October we ate two of the smaller ones. They were fried in lard, as fresh fish are often cooked, and all who tasted them pronounced them exceedingly good. — DAVID SCOTT, *Elkton, Md.*

222. FRIED IN LARD AND OIL. — Yes, sir; fried in lard and cotton-seed oil; we prefer the oil. We think they are a very fine fish and very sweet. — E. B. PLUNKET, *Atlanta, Ga.*

223. SLICED AND FRIED WITH EGGS AND CRUMBS. — The only one eaten was cut into steaks, dipped into egg and bread crumbs, and fried. The quality was good. — JOHN PICKERING, *Fontana, Kans.*

224. FRIED AND BOILED: GOOD. — We have eaten and presented to our neighbors about 100, and all regard their edible quality good. We fry them and boil them same as rock fish. — JOHN S. DALLAM, *Bel Air, Md.*

225. BROILED: FIRST RATE. — Yes; broiled, with butter and pepper, they are first rate. — SAMUEL T. EARLE, *Centreville, Md.*

226. BROILED WITH LEMON SAUCE: DELICIOUS. — Yes; broiled, with lemon sauce, and baked, they are delicious. — P. H. COLEMAN, *Union Springs, Ala.*

227. BAKED OR FRIED. — Last fall we ate two mirror carp, and the 7th of August, 1883, two weighing 4 pounds and one ounce. One was stuffed and roasted, the other fried. A. Stout, Dr. Terry, S. Sharp, John Bidger, and others join me in saying they are the

best they ever tasted. About twenty persons tried them on my fifty-sixth birthday. — Dr. SETH G. BIGELOW, *Silver Lake, Ind.*

228. SKIN, AND FRY OR BAKE THEM. — We first skin them, then thoroughly scald them and either fry or bake them. — O. A. GILMAN, *Paris, Ky.*

229. EATS THEM VARIOUS WAYS. — I have eaten them abroad in various styles of cooking, but have eaten none of mine. — DANIEL C. BIRDSALL, *Westport, Conn.*

230. ALL WAYS: VERY EDIBLE: SCALE CARP BEST. — I have eaten quite a number fried, baked, stewed, and boiled. When properly prepared they are very edible. — SAMUEL M. SUBERS, *Macon, Ga.*

231. ALL WAYS: EQUAL TO SHAD. — Baked, boiled, stuffed, fried, served on rice, eggs, toast, etc., they are equal to shad. — ABEL A. WRIGHT, *Griffin, Ga.*

232. ALL WAYS, BUT LARGE ONES ARE BEST BOILED. — Yes; boiled, baked and fried. They are best boiled when large. — BENJAMIN D. PALMER, *Sandy Springs, Md.*

233. PREFERS THEM BOILED. — Have been eating them all summer, broiled, fried and boiled. Boiled is thought the best with us and by others that have eaten them. — Capt. E. HERMAN, jr., *Towson, Md.*

234. BOILED LIKE ROCK: GOOD. — Yes; fried and boiled. The larger carp boiled and served as rock are served is palatable and good. — ROBERT E. WITHERS, *Wytheville, Va.*

235. A GERMAN METHOD. — It was with no common pleasure that we were called on to witness the preparations for an original and savory meal, which the forester of Max von dem Borne [of Berneuchen, Germany] cooked with consummate skill, closely following the method employed by the North American trappers and sportsmen during their camp-life in the vast forests of the Western Hemisphere. Four plump carp were cleaned, washed, well strewed with salt and pepper both on the inside and the outside, and thereupon wrapped — each one separately — in a white sheet of paper well buttered. Round this a sheet of newspaper was wrapped, the package was for a few moments dipped in cold water, and finally placed on a bed of hot coals of an open fire. Above the four carp came a layer of raw potatoes, which were thus baked in the ashes. In about half an hour the “pepper carps” were ready for the table. Full of their own juice, they formed a most tempting and delicious dish, and being handed round, together with potatoes, on large napkins, satisfied even the most epicurean taste. [From the Magdeburgische Zeitung, No. 501, Magdeburg, October 27, 1881.]

236. GERMAN METHOD OF COOKING. — Yes; many a one in Germany. When young, say 2 to 3 pounds, they will do to fry; but when they weigh 10 to 50 pounds they are generally stewed in water first, afterwards in a gravy made of brown bread, a small portion of sugar or of molasses is added, and then they put in enough of brown beer to make gravy sufficient to cover the fish and also according to the size of the family. — LEO WELTZ, *Wilmington, Ohio*.

237. BOILED IN BEER: DELICIOUS. — Yes, sir; they were boiled in beer after the Saxon fashion (not lager beer, however, but what is called common beer). They were delicious. — HUGO MULERTT, *Cincinnati, Ohio*.

238. WINE METHOD OF COOKING. — I have eaten carp and find them good. One specimen of 5 pounds and two years old, taken from a pond on Long Island, was cooked as follows: First boiled in white wine for 15 minutes and then baked in an oven and served with a white-wine sauce. It was eaten by a number of epicures, and by all pronounced a fine table-fish. — EUGENE G. BLACKFORD, *Fulton Market, New York, N. Y.*

239. PARTLY BOILED AND PARTLY BAKED: FIT FOR A KING. — I always instruct the cook to clean them nicely; then wrap the fish in a linen towel, have a large kettle of water boiling, coil the fish neatly in the kettle and boil fifteen minutes, then turn off the water, remove to a baking pan without marring and put in the oven, bake and then baste with butter gravy. A nice dressing could occupy the interior of the fish and the space around the sides. If properly done it makes a dish fit for a king or a hungry fisherman, — W. VAN ANTWERP, *Mount Sterling, Montgomery County, Ky., Oct. 31, 1882*.

240. SKINNED, DIPPED, AND FRIED: EXCELLENT. — The carp we caught from our pond last September to eat were skinned when dressed, cut into pieces of suitable size, dipped in flour, and fried. It was excellent. — GUSTIN HAVENS, *Lewis Centre, Ohio*.

241. BOILED: BUTTER GRAVY: RESEMBLED LOBSTER. — I ate but one carp, which was boiled and served with a butter gravy. A friend, who was taking dinner with me, as well as myself, pronounced it "very good indeed," although different from any other fish, with a faint resemblance to lobster in taste. It is, however, not impossible that we both were prejudiced in favor of carp. — A. RAHT, *South Cottonwood, Salt Lake County, Utah, Feb. 9, 1883*.

242. AN EXCELLENT RECEIPT FOR FRYING CARP. — Be sure to clean the fish thoroughly. Remove the fat from the inside. Place

the fish in a weak brine over night. Wipe it thoroughly dry and cover it with flour or meal, Have the fat boiling hot and do not put the fish in until it is boiling. Fry quickly, and brown as you like to have it. — Prof. E. T. Cox, *New Harmony, Ind.*

THE GERMAN CARP AND ITS INTRODUCTION IN THE UNITED STATES.

BY CHAS. W. SMILEY.

[A paper read before the American Association for the Advancement of Science, at the Minneapolis meeting, 1883.]

1. SYSTEMATIC POSITION, VARIETIES, AND ECONOMIC RELATIONS. — The German carp belongs to the family *Cyprinidae*, and genus *Cyprinus*. Of the *Cyprinus carpio* there are three varieties: the scaled, which is the most edible; the leather, which is the most prolific; and the mirror, which is intermediate between the other two. The common gold fish, *Cyprinus auratus* Linnæus, is an allied species, with which the German carp very readily hybridizes.

The present purpose is not to speak of carp from a biological stand-point, but from an economic one, especially as there is little that is new with reference to its biology and much that is new when economically considered.

2. HISTORY OF ITS INTRODUCTION. — The carp was originally from Central Asia, whence it was introduced into Europe a few centuries ago: into England in 1504, and into Austria in 1227. It is alleged that Capt. Henry Robinson brought carp from Holland to the United States about 1830 and put them into his ponds at Newburg, N. Y., from whence they escaped into the Hudson.* As nothing practical came of this, the real introduction of carp into the United States dates from May 26, 1877, at which date Mr. Rud. Hessel arrived from Bremen with 345 carp of different varieties for the United States Fish Commission.† These were propagated under the direction of Prof. S. F. Baird. The distribution of their young commenced in the fall of 1879, and has continued to the present time in increasing quantities annually. The number distributed in 1879 was 6,203 to 273 applicants in 24 different States of the Union. In 1880, 31,443 were distributed to 1,374

* See Bulletin of the United States Fish Commission, 1882, page 25.

† Report of United States Fish Commissioner for 1877, page 43.

different applicants in 34 different States and Territories. During the past season 113,605 have been distributed in lots of from 15 to 20 to each applicant.

3. NATURAL HISTORY. — The carp prefers a pond containing warm water and muddy bottom, but neither of these are absolutely essential. It feeds upon such worms and lower forms of animal life as are within its reach, but never upon other fishes. It will, however, eat its own eggs if forced to by hunger. It is very fond of vegetable food, such as lettuce, cabbage, leaves of various water plants, seeds, grain, meal, bread, crackers, corn-bread, &c. Most anything you would give to chickens you can give to carp to eat.

If the water is warm, the summer long, and there be plenty of food, either natural or artificial, the growth of the carp will be surprisingly rapid. There are well authenticated reports of it reaching 3 pounds in one year and 6 pounds in two years. If no artificial food is furnished, and there is also a scarcity of natural food, or if the climate be cold, the growth will be much less rapid. Indeed, when the water becomes quite cold it will partially bury itself in mud and lie in a dormant state through the entire winter and until spring fairly sets in. In the southern part of Texas it is probable that the carp will not be forced to hibernate at all except in case of an unusually severe winter. In the northern parts of Maine and Minnesota it may be expected to hibernate nearly half the year. As it cannot grow during its hibernation, it is easy to see why so much more rapid growth is obtained in Texas than in Vermont. There is little danger, however, of its freezing to death, for carp have survived in tubs of water over which a thick film of ice has accumulated.

Carp usually spawn in cool latitudes the third year, in temperate latitudes the second year, and there are well authenticated instances of its having spawned in Southern Texas at the age of one year. These cases, however, are where carp are supplied with an abundance of food, well cared for, and protected from their numerous enemies.

The enemies of carp are legion, and in many cases exterminate the fish. Not only do all kinds of carnivorous fish prey upon its young, but nearly all kinds of fish will eat its eggs. Frogs, snakes and turtles will eat both eggs and young in numerous quantities. A snake was recently killed at the carp ponds in Washington in which was found over 25 young carp and numerous undigested skeletons of the same fish. One medium size snake, if furnished the proper facilities, can be depended upon to eat forty carp per day, one thousand per month, or five thousand each summer. Divide your number of young carp by this figure and you can find

out how many snakes it will require to exterminate your young. Various birds, such as kingfishers, bitterns, cranes, herons and fish-hawks understand catching carp much better than the average farmer. About the 17th of July last a marsh hen was shot at the Washington carp ponds whose stomach contained 38 young carp, and a night heron whose stomach contained the heads of 78 young carp. In many cases where the carp have been left to the mercies of these enemies they have succumbed. The only proper method is to furnish protection to the carp until they reach such an age as to be well able to cope with these enemies. It is therefore best to separate the spawning carp from all other animals, and carefully protect the eggs of the young for as long a time as convenient.

In regard to the food qualities of carp, it ranks somewhat above the ordinary native fish, such as buffalo, mullet, suckers, mud-fish, croakers, mill-roach, perch, sunfish, &c., but it is hardly equal to the high-priced delicate class of fish which includes the bass, trout and shad. And yet many persons who are cultivating carp declare them equal to any fish they ever tasted. If carp are grown in muddy or polluted water their flesh, like that of any other animal, will be impregnated thereby. But the carp may be removed to pure water for a week, during which the system will be purified, and at the end of which even these will be good eating. Some have alleged that salting such over night will greatly improve the flavor. During and immediately after the spawning season adult carp, like all other fish, become soft and unfit to eat. Some persons have ignorantly tasted of them at this season, and have therefrom very unjustly condemned them. Carp contain bones, of course, but in the adult the flesh flakes off from the bones very nicely. Even in the small ones the bones are no more objectionable than in the average fish.

4. THE METHOD OF DISTRIBUTION. — Several breeding ponds have been fitted up at Washington from the so-called Babcock lakes and from extensions into the Potomac marshes. These will present a very picturesque appearance, in addition to their usefulness, after the reclamation of the Potomac flats. These ponds are constantly watched by their superintendent, Mr. Rud. Hessel and his assistants, who have abundant facilities for destroying enemies, draining the ponds, supplying fresh water, food, &c. At the proper season, which extends from October 15 to January or February, the young are sent out by one of two methods: first, they are put in five and ten gallon cans of water and loaded in the cars of the Fish Commission, of which there are two fitted up with suitable appliances for carrying all kinds of fish. These cars, which present an outward appearance of parlor cars, are dis-

patched on passenger trains to central points in all the different States of the Union, where instalments may be delivered to State fish commissioners or the carp treated by the second method. Second, a quart pail containing a pint of water and 15 to 20 carp can be sent by express to any distance which will not require more than 36 to 48 hours, or even further, if the water can be changed meantime, always provided that water enough remains in the pail to cover the backs of the fish. Most of the States of the Union have appointed State commissioners, who receive installments from the United States Fish Commission and distribute them to applicants within their jurisdiction. Many of them have also established propagating ponds, in which they are already producing young by the thousands and tens of thousands. Some private speculators have received carp from the United States Fish Commission, reared young, and are now selling them at speculative rates. The price list of one of these gentlemen states that he will sell mirror carp ten months old at \$75 per hundred, scale carp ten months old, at \$70 per hundred. Large fish are even sold at five dollars a pair and would perhaps be sold at higher rates were it not for the fact that the United States Fish Commission furnishes its small fish free of cost. The express charges constitute the only expense to the recipient.

5. ECONOMIC RESULTS.—The cultivation of fish is destined to become as important among American farmers and planters as the cultivation of cattle, sheep, swine, poultry, or of grains, fruits, and berries. They have long since ceased to leave the latter to shift for themselves and to cope with their enemies, knowing that in such a struggle live stock, grains, and fruits come off second best or succumb. Fish should receive the same care and attention, both as to improving varieties, artificial propagation and growth. The practice which farmers will obtain in carp culture will probably open the way to the successful culture of various other kinds of fish. The hardiness and wide range of diet and the rapid growth of carp especially fit it to be the precursor in fish farming. Every rural community is destined to have its fish ponds in the same abundance that it has its pig pens or its poultry yards. This will enable every farmer, however remote from market, to introduce fresh fish into his bill of fare at a very trifling cost. The carp may be made a pleasurable pet, learning to come to its food at call, if habitually fed in one place, and in shallow water, or upon a plank submerged a few inches. From these places, by reason of its tameness, it can be taken even with the hands. Finally, there is no more tasteful and economic means of decorating a plantation or a country seat than by a carp pond neatly prepared and protected. If, however,

any persons should imagine that these good results are to be attained merely by filing an application for carp and upon the receipt of the fish leaving them to shift for themselves, and unaided to cope with their enemies, it is well that their minds be disabused at the first, for there is no provision of nature anywhere whereby a man shall obtain his daily bread except by the sweat of his brow.

UNITED STATES FISH COMMISSION, August 21, 1883.

[F.]

LEGISLATION.

[CHAP. 31.]

AN ACT relative to Fishing in the Merrimack River.

Be it enacted, etc., as follows:

For the purpose of taking fish called “shiners” for bait, any person may draw a net or seine during the months of November and December at any point in the Merrimack River, except within four hundred yards of any fishway; *provided*, that all other fish so caught are immediately returned to the waters from which they were taken; and the penalties provided for in sections thirty-six, thirty-seven, thirty-eight and thirty-nine of chapter ninety-one of the Public Statutes shall not apply to the taking of fish as herein provided. [Approved March 6, 1883.]

[CHAP. 76.]

AN ACT in addition to An Act to regulate the taking of Fish in North River in the county of Plymouth.

Be it enacted, etc., as follows:

SECT. 1. Whoever sets a seine or casts a mesh net in the North River in Plymouth County, or whoever by seine or mesh net takes any fish from said North River, except such persons as have authority so to do under chapter forty-four of the acts of the year eighteen hundred and eighty-one, shall be punished for each offence by a fine not less than equal twenty-five dollars nor more than one hundred dollars, or by imprisonment in the house of correction not less than one nor more than three months.

SECT. 2. Section four of chapter forty-four of the acts of the year eighteen hundred and eighty-one is hereby amended by inserting after the word “fish,” in the second line, the words “from two o’clock in the morning until sunset.” [Approved March 24, 1883.]

[CHAP. 121.]

AN ACT to authorize the Commissioners on Inland Fisheries to issue permits for Fishing in the Merrimack River.

Be it enacted, etc., as follows:

SECT. 1. The commissioners on inland fisheries may issue permits for the taking of any variety of fish in the tidal waters of the Merrimack River and its tributaries, the taking of which is now in any way prohibited by law. Such permits shall be revocable at the discretion of said commissioners, and no fee or consideration shall be charged for the issuing of the same.

SECT. 2. This act shall take effect upon its passage. [*Approved April 11, 1883.*]

[CHAP. 180.]

AN ACT to regulate the taking of Fish in Acushnet River in the town of Acushnet.

Be it enacted, etc., as follows:

SECT. 1. The town of Acushnet may at any legal meeting called for that purpose make regulations, not inconsistent with the provisions of the laws of the Commonwealth, concerning the taking of herrings, alewives and shad within said town, or concerning the disposal of the privilege of taking the same for its own use and benefit.

SECT. 2. Said town may, at its annual meeting in April in the year eighteen hundred and eighty-three, and in each year thereafter, choose three discreet persons by ballot whose duty it shall be to inspect said river, to cause the regulations respecting said fishery to be carried into effect and to prosecute all violations thereof.

SECT. 3. Whoever takes from said river any of said fish in violation of said regulations shall forfeit for each fish so taken not more than ten dollars nor less than one dollar, one half of all such forfeitures shall enure to the complainant and one half to said town.

SECT. 4. The powers and duties granted by this chapter shall be subject in all respects to the rights heretofore granted to the city of New Bedford under chapter one hundred and sixty-three of the acts of the year eighteen hundred and sixty-three, and nothing contained in this act shall in any way be construed as permitting or authorizing any interference with the water supply of said city, or authorizing any control in or in any way applying to the storing reservoir of said city or any works connected with its water supply, nor shall any such fishery be permitted to be operated in said reservoir or in any portion of said water supply.

SECT. 5. This act shall take effect upon its passage. [*Approved May 16, 1883.*]

[G.]

LIST OF PONDS LEASED

*By the Commissioners on Inland Fisheries, under Authority given by Chap. 384, Sect. 9, of the Acts of 1869.**

1870.

- Feb. 1. Waushakum Pond, in Framingham, to Sturtevant and others, 20 years.
April 1. Mendon Pond, in Mendon, to Leonard T. Wilson and another, 20 years.
Sept. 12. Baptist Lake, in Newton, to J. F. C. Hyde and others, 20 years.
Oct. 15. Archer's Pond, in Wrentham, to William E. George, 15 years.

1871.

- Jan. 10. Nine-Mile Pond, in Wilbraham, to B. F. Bowles, 10 years.
30. Little Pond, in Falmouth, to F. H. Dimmick, 10 years.
April -. Spectacle, Triangle, and Peters ponds, in Sandwich, to G. L. Fessenden and another, 5 years.
17. Long Pond, in Falmouth, to Joshua S. Bowerman and three others, 20 years.
May 15. Pratt's Pond, in Upton, to D. W. Batcheller, 20 year .
18. Little Sandy Pond, in Plymouth, to William E. Perkins, 15 years.
Nov. 1. Punkapoag Pond, in Randolph and Canton, to Henry L. Pierce, 20 years.

* We would remind lessees of ponds that they are required, by their leases, to use all reasonable efforts to stock their ponds, and keep accurate records of the same, and make returns of their doings to the Commissioners on the 1st of October, each year, of the number and species of fish which they have put in or removed from their ponds. Any failure to comply with these conditions is a breach of contract invalidating their lease. It is important that the State should know just what is being done; and, where there appears to be mismanagement or apparent failure, the Commissioners will visit the ponds, and ascertain, if possible, the cause.

1872.

- Jan. 1. Sandy Pond, Forest Lake, or Flint's Pond, in Lincoln, to James L. Chapin and others, 20 years.
- July 20. Little Pond, in Braintree, to Eben Denton and others, 20 years.

1873.

- May 1. Meeting-house Pond, in Westminster, to inhabitants of Westminster, 15 years.
1. Great Pond, in Weymouth, to James L. Bates and others, 15 years.
- July 1. Little Sandy Pond, in Pembroke, to A. C. Brigham and others, 16 years.
- Sept. 1. Pontoosuc Lake, in Pittsfield and Lanesborough, to E. H. Kellogg and others, 15 years.
- Oct. 1. Farm Pond, in Sherborn, to inhabitants of Sherborn, 15 years.
1. Spot Pond, in Stoneham, to inhabitants of Stoneham, 15 years.
- Nov. 1. Lake Chaubunagungamong, or Big Pond, in Webster, to inhabitants of Webster, 5 years.
- Dec. 1. Lake Wauban, in Needham, to Hollis Hunnewell, 20 years.

1874.

- Mar. 1. Walden and White Ponds, in Concord, to inhabitants of Concord, 15 years.
2. Upper Naumkeag, in Ashburnham, to inhabitants of Ashburnham, 20 years.
- April 1. Elder's Pond, in Lakeville, to inhabitants of Lakeville, 15 years.
20. North and South Podunk Ponds, in Brookfield, to inhabitants of Brookfield, 15 years.
- May 1. Maquan Pond, in Hanson, to the inhabitants of Hanson, 15 years.
2. Brown's Pond, in Peabody, to John L. Shorey, 15 years.
16. Wickaboag Pond, in West Brookfield, to Lemuel Fullam, 15 years.
20. Unchechewalom and Massapog ponds, to the inhabitants of Lunenburg, 20 years.
- July 1. Hardy's Pond, in Waltham, to H. E. Priest and others, 15 years.
1. Hockomocko Pond, in Westborough, to L. N. Fairbanks and others, 15 years.
11. Mitchell's Pond, in Boxford, to R. M. Cross and others, 15 years.

1874.

- July 11. Hazard's Pond, in Russell, to N. D. Parks and others,
20 years.
- Oct. 1. East Waushacum Pond, in Sterling, to inhabitants of
Sterling, 20 years.
20. Middleton Pond, in Middleton, to inhabitants of Mid-
dleton, 15 years.

1875.

- Jan. 1. White and Goose Ponds, in Chatham, to George W.
Davis, 15 years.
- Mar. 1. Lake Pleasant, in Montague, to inhabitants of Monta-
gue, 10 years.
1. Hood's Pond, in Ipswich and Topsfield, to inhabitants
of Topsfield, 15 years.
- April 1. Chauncey Pond, in Westborough, to inhabitants of
Westborough, 15 years.
3. West's Pond, in Bolton, to J. D. Hurlburt and others,
15 years.
15. Gates Pond, in Berlin, to E. H. Hartshorn and others,
15 years.
24. Pleasant Pond, in Wenham, to inhabitants of Wenham,
15 years.
- May 1. Morse's Pond, in Needham, to Edmund M. Wood, 15
years.
1. Great Pond, in North Andover, to Eben Sutton and
others, 20 years.
1. Chilmark Pond, in Chilmark, to J. Nickerson and
others, agents, 20 years.
- July 1. Winter Pond and Wedge Pond, in Winchester, to in-
habitants of Winchester, 15 years.
1. Haggett's Pond, in Andover, to inhabitants of An-
dover, 20 years.
- Aug. 1. Oyster Pond, in Edgartown, to J. H. Smith and others,
20 years.
7. West Waushacum Pond, in Sterling, to inhabitants of
Sterling, 20 years.
9. Mystic (Upper) Pond, in Winchester, Medford, and
Arlington, to inhabitants of Winchester and Med-
ford, 15 years.
- Oct. 1. Little Chauncey and Solomon ponds, in Northborough,
to inhabitants of Northborough, 15 years.

1876.

- Feb. 1. Great Sandy Bottom Pond, in Pembroke, to Israel
Thrasher and others, 15 years.

1876.

- Mar. 1. Dennis Pond, in Yarmouth, to inhabitants of Yarmouth, 15 years.
1. Crystal Lake, in Wakefield, to Lyman H. Tasker and others, 15 years.
20. Lower Naumkeag Pond, in Ashburnham, to inhabitants of Ashburnham, 18 years.
28. Dennison Lake, in Winchendon, to inhabitants of Winchendon, 15 years.
28. Phillipston Pond, in Phillipston, to inhabitants of Phillipston, 20 years.
- May 8. South-west Pond, in Athol, to Adin H. Smith and others, 15 years.
- June 1. Norwich Pond, in Huntington, to inhabitants of Huntington, 20 years,
10. Dug Pond, in Natick, to W. P. Bigelow and others, 15 years.
- Oct. 1. Farm and Learned's Pond, in Framingham, to inhabitants of Framingham, 15 years.
1. Whitney's Pond, Wrentham, to inhabitants of Wrentham, 15 years.
1. Little Pond, in Barnstable, to George H. Davis, 15 years.

1877.

- Mar. 1. Nine-Mile Pond, in Wilbraham, to inhabitants of Wilbraham, 15 years.
15. Pentucket and Rock ponds, in Georgetown, to inhabitants of Georgetown, 15 years.
- Aug. 10. Onota Lake, in Pittsfield, to William H. Murray and others, 15 years.
- Oct. 1. Fort, Great Spectacle, and Little Spectacle ponds, in Lancaster, to inhabitants of Lancaster, 20 years.
1. Battacook Pond, in Groton, to George S. Graves and others, 15 years.
- Nov. 1. Tispaquin Pond, in Middleborough, to Abishai Miller, 15 years.
1. Asnebumskitt Pond, in Paxton, to Ledyard Bill and others, 15 years.

1878.

- Jan. 1. Sniptuit, Long, Snow, and Mary's ponds, in Rochester, to inhabitants of Rochester, 15 years.
- Mar. 16. Asnaconcomie Pond, in Hubbardston, to Amory Jewett, jun., 15 years.
- April 1. Dorrity Pond, in Millbury, to inhabitants of Millbury, 10 years.

1878.

- May 5. Spectacle, Peters, and Triangle ponds, in Sandwich, to George L. Fessenden, 10 years.
1. Bear Hill Pond and Hall Pond, in Harvard, to inhabitants of Harvard, 15 years.
- July 1. Lake Buell, in Monterey and New Marlborough, to Andrew L. Hubbell and others, 5 years.
- Oct. 1. Eel Pond, in Melrose, to J. A Barrett and others, 15 years.
1. Accord Pond, in Hingham, South Scituate, and Rockland, to inhabitants of those towns, 10 years.
1. Wright's and Ashley's ponds, in Holyoke, to Henry C. Ewing and others, 10 years.
1. Magog Pond, in Acton and Middleton, to inhabitants of Acton, 15 years.

1879.

- Feb. 1. Lake Mahkunac and Lake Overic, in Stockbridge, to inhabitants of Stockbridge, 10 years.
- June 1. "Bald Pate," "Four Mile," and "Stiles" ponds, in Boxford, to inhabitants of Boxford, 10 years.
- July 1. Silver Lake, in Wilmington, to inhabitants of Wilmington, 10 years.
1. Fresh Pond, in Falmouth, to Thomas H. Lawrence, 20 years.
- Oct. 1. Pomp's Pond, in Andover, to inhabitants of Andover, 15 years.
- Nov. 1. Lake Quinapowitt, in Wakefield, to inhabitants of Wakefield, 14 years.

1880.

- Jan. 1. Granite-Cove Pond, in Gloucester, to David Babson, 10 years.
- Mar. 1. Lake Winthrop, in Holliston, to inhabitants of Holliston, 15 years.
15. Massapoag Pond, in Sharon, to inhabitants of Sharon, 10 years.
- May 1. Tisbury Great Pond, in Tisbury, to Allen Look and others, 10 years.
- June 1. Indian Pond, in Kingston, to inhabitants of Kingston, 10 years.
1. Jordan Pond, in Shrewsbury, to inhabitants of Shrewsbury, 15 years.
- July 1. Swan and Martin's ponds, in North Reading, to inhabitants of North Reading, 15 years.
- Sept. 1. Herring Pond, in Eastham, to William H. Nickerson, 10 years.

1880.

- Dec. 24. Chadwick's Pond, in Bradford and Boxford, to town of Bradford, 10 years.

1881.

- Jan. 1. Great and Job's Neck ponds, in Edgartown, to Amos Smith and others, 15 years.
Mar. 1. The Mill Ponds (three), in Brewster, to Valentine B. Newcomb and another, 15 years.
May 2. Nonesuch Pond, in Weston and Natick, to W. A. Bul-
lard and others, 15 years.
April 1. Long Pond, in Blandford, to Samuel A. Bartholomew
and another, 15 years.

1882.

- Mar. 1. Blair's Pond, in Blandford, to Curtis M. Blair and
another, 15 years.
April 1. Ward Pond, alias Wightman Pond, in Ashburnham, to
Herbert F. Rockwood and another, 15 years.
May 1. Horn Pond, in Woburn, to inhabitants of Woburn, 15
years.
June 1. Wickaboag Pond, in West Brookfield, to inhabitants of
West Brookfield, 15 years.
Oct. 1. Long and Hummock ponds, in Nantucket, to Charles
E. Snow and others, 15 years.

1883.

- Mar. 1. Halfway Pond, in Plymouth, taken by Commissioners
for 5 years, in accordance with provisions of Chap.
62, Acts of 1876.
April 6. Fresh Pond, in Tisbury, to Allen Look and others, 15
years.
April 23. Keyes Pond, in Westford, to M. H. A. Evans, 15
years.
May 7. Singletary Pond, in Sutton and Millbury, to towns
of Sutton and Millbury, 15 years.
May 7. The Great Pond, in Ashfield, to town of Ashfield, 15
years.

[H.]

EXTRACTS FROM RETURNS ON PONDS.

EEL POND, MELROSE.

13 black bass, weight,	.	.	.	.	.	.	24 $\frac{3}{4}$ lbs.
206 pickerel,	"	.	.	.	.	.	181 $\frac{3}{4}$ "
320 perch,	"	.	.	.	.	.	92 $\frac{1}{2}$ "
29 pouts,	.	.	.	.	.	.	.
13 eels,	.	.	.	.	.	.	.

HENRY A. BUSH.

SANDY POND, LINCOLN.

Black bass slowly increasing each year. The number of fish taken from the pond cannot be given with accuracy, but persons skilled in black-bass fishing have had some good days' fishing when they took from 6 to 25 good-sized fish. As a rule they are not taken in great numbers by any one.

I estimate the number taken from the pond during the year at not more than 500, weighing perhaps 1,000 pounds.

JAMES L. CHAPIN.

DENNISON POND, WINCHENDON.

The Fish Committee of the town of Winchendon would report that so far as they can judge from observations made and the fish known to have been taken, that the stocking of this pond is a success. Of the land-locked salmon obtained from the State four or five years ago, some have been taken of from $\frac{3}{4}$ of a pound to 1 $\frac{1}{2}$ pounds in weight, each: those of less than one pound being returned to the lake. Enough were seen to warrant the belief that the salmon are doing well and are getting in a condition and of an age to propagate and keep their numbers good. The land-locked salmon and trout fry furnished us last spring by the Commission, were all put into the waters in good condition and without loss. A few black bass have been taken, some weighing two and three

pounds and over, which shows that of those put in, some have lived and flourished and will be heard from more in the near future.

The State Commissioners have our thanks for the very liberal supply of fry given us for stocking purposes.

E. S. MERRILL.

HAZARD POND, RUSSELL.

The stocking of this pond with black bass has been a great success. During the past year the pond has been increased in depth and acreage by a dam, which, of itself, has very much benefited and assisted in raising fish. At present we have large numbers of black bass and pickerel, the latter being in the pond when it was leased. Of the land-locked salmon I can only say that they have entirely disappeared — not having been seen for two or three years. During the past season a large number of fish have been taken from the pond. For many years after the pond was stocked with bass, it was closed and when it was opened to fishing we found the fish poor and of little use. Now, however, it is different; they have increased largely in numbers and improved in quality. In fact I never saw fatter or finer quality of fish in my life. We feel much gratified at the results attained in stocking Hazard Pond. Any particulars you may desire in relation to this matter I shall be pleased to furnish.

WESTFIELD.

W. H. FOOTE

CRYSTAL LAKE, WAKEFIELD.

111 black bass, weight,	.	.	.	.	.	144½ lbs.
309 pickerel, “	.	.	.	.	.	238 “
1,750 yellow perch,	.	.	.	.	.
32 white perch,	.	.	.	.	.
600 pouts,	.	.	.	.	.
40 bream,	.	.	.	.	.
5 eels,	.	.	.	.	.

LYMAN H. TASKER.

MASSAPOAG POND, SHARON.

There were issued to inhabitants of this town 263 permits. Estimated weight of fish caught 1,315 pounds, fully one-third of which was black bass, the remainder perch and pout. The bass have been on the average larger than previously.

HENRY A. BOYDEN.

PONDS IN ROCHESTER.

215 black bass, average weight,	. . . . .	2 lbs.
813 pickerel,	. . . . .	-
150 white perch,	. . . . .	-
375 red "	. . . . .	-

GEO. WELD.

LITTLE SANDY POND, PEMBROKE.

Black bass,	. . . . .	100
Pickerel,	. . . . .	56

This represents but a small part of the bass caught, all under 2 pounds being returned alive.

A. C. BRIGHAM.

MORSE'S POND, NEEDHAM.

Black bass,	. . . . .	75 lbs.
Pickerel,	. . . . .	175 "
Perch,	. . . . .	134 "
Pout,	. . . . .	80 "

EDMUND M. WOOD.

LEARNED'S AND FARM PONDS, FRAMINGHAM.

The stocking of Learned's Pond with black bass has proved a success. The number as well as the size of fish taken was large, from 4 to 6 pounds being common. Farm Pond, which is a storage-basin for Sudbury River water, was stocked with Plymouth white perch, — also a perfect success. A considerable number have been taken the present year and acknowledged the best fish taken from our waters. The land-locked salmon seem a failure, as we have never seen one of any size, nor heard of any being taken.

CHAS. W. COOLIDGE.

HOCKOMOCKO POND, WESTBOROUGH.

58 black bass, weight,	. . . . .	133 lbs.
130 pickerel, "	. . . . .	148 "

Nothing to report with regard to land-locked salmon, as nothing has been seen of them since they were put in the pond.

GEO. O. BRIGHAM.

INDIAN POND, KINGSTON.

Black bass,	.	.	.	.	.	.	.	.	.	21
Pickrel,	.	.	.	.	.	.	.	.	.	154
Perch,	.	.	.	.	.	.	.	.	.	279

JOHN F. HOLMES.

TISBURY GREAT POND, TISBURY AND CHILMARK.

White perch,	.	.	.	.	.	.	.	.	.	5,800
Alewives,	.	.	.	.	.	.	.	.	.	89,731
Striped bass,	.	.	.	.	.	.	.	.	.	8
Smelts,	.	.	.	.	.	.	.	.	.	126,800
Tautog,	.	.	.	.	.	.	.	.	.	57

ALLEN LOOK.

GREAT AND JOB'S NECK PONDS, EDGARTOWN.

White perch,	.	.	.	.	.	.	.	.	.	15,066
Alewives,	.	.	.	.	.	.	.	.	.	72,591
Smelts,	25,955
Eels,	6,000

AMOS SMITH.

CHILMARK POND, CHILMARK.

Alewives,	19,399
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JOHN W. MAYHEW.

OYSTER POND, EDGARTOWN.

Perch,	23,560
Smelts,	65,728
Alewives,	15,798
Tautog,	.	.	.	.	.	.	.	.	.	558
Eels,	.	.	.	.	.	.	.	.	.	2,312

JOPHANUS H. SMITH.

ANDOVER, Dec. 6, 1883.

To the Commissioners of Inland Fisheries:

On behalf of the lessees of Haggett's Pond and Pomp's Pond, in Andover, we would respectfully report, that fishing has been allowed in Haggett's Pond on thirteen days during the past season. While no accurate account of the catch was kept, or was practicable, the number of black bass taken was apparently in excess of the number in any former year save the first, and indications of a steady increase of these fish in the pond are marked.

Several thousand fry of the Lake Superior salmon trout furnished by your board, placed in the pond last spring without loss of a single one in transit.

Under license from your board, some 25 or 27 bass were taken from Haggett's Pond, out of season, and placed in Pomp's Pond. They varied in weight from a few ounces to three pounds, and are believed to be sufficient in number to stock successfully this small pond.

Respectfully submitted.

INHABITANTS OF ANDOVER, *Lessees.*

By GEO. H. POOR, *of their Fish Com.*

HUNTINGTON, MASS., Dec. 8, 1883.

E. A. BRACKETT, Esq., *Commissioner of Inland Fisheries:*

DEAR SIR, — One hundred and nine fishing permits have been issued for fishing in Norwich Pond during the present year to residents of Huntington and non-resident tax-payers therein, and seventy-five fishing permits have been issued to non-residents who are not tax-payers in said town. As the fishing permits, which call for the number and weight of fish caught, have not generally been filled out, we are not able to report definitely in regard to those matters, but estimate as follows: 75 black bass, weighing 125 pounds; 150 pickerel, weighing 250 pounds; 3,500 perch, weighing 700 pounds; 300 bull-heads, weighing 100 pounds; 25 eels, weighing 30 pounds; and 75 suckers, weighing 40 pounds. No land-locked salmon have been taken from the pond.

The income from the pond for the fishing year, beginning May 15 and ending October 15, 1883, was thirteen $\frac{71}{100}$ dollars,* and the pond keeper's fees were six $\frac{85}{100}$ dollars, leaving the net income six $\frac{86}{100}$ dollars.

Submitted with respect.

SCHUYLER CLARK,

AUSTIN REEDE,

LEWIS A. CLARK,

Fish Committee of Huntington.

MILLBURY, MASS., Dec. 19, 1883.

E. A. BRACKETT, Esq., *Commissioner of Inland Fisheries:*

DEAR SIR, — The inhabitants of the town of Millbury, lessees of Dimity Pond, for the purpose of cultivating useful fishes, by their selectmen, would respectfully submit the following report.

The pond was stocked with black bass in 1878-9, through the liberality of Chas. W. Seabury, Esq., a citizen of the town.

* Probably from permits to non-residents.

The present season, ending Dec. 1, 1883, is the first that fishing has been allowed in the pond since it was stocked.

Permits for fishing have been issued to 791 persons, citizens of the town. These permits were returnable Dec. 1st, but at this date only 72 have been returned, say 9 per cent. This report will therefore be necessarily incomplete, as it must be based upon so small a percentage of permits issued.

From the 72 permits returned, it appears that the 49 fishers have caught 5 black bass, weighing $11\frac{1}{2}$ pounds; 132 pickerel, weighing $175\frac{1}{2}$ pounds; 218 perch, weighing 92 pounds, and other fish, mostly horned pouts, 472, weighing 48 pounds, as will be seen from the following table:

KIND OF FISH.	Number.	Pounds.
Black bass,	5	$11\frac{1}{2}$
Pickerel,	132	$175\frac{1}{2}$
Perch,	218	92
Other fish,	472	48
Total,	827	327

An estimate of the fish caught under the whole 791 permits issued, based upon the returns made by the above 72 holders of permits, would be as follows: —

Return of Fishing in Dimity Pond, 1883. Permits issued, 791.

KIND OF FISH.	Number.	Pounds.
Black bass,	55	126
Pickerel,	1,450	1,928
Perch,	2,395	1,011
Other fish,	5,185	527
Total,	9,085	3,592

A fuller report will be sent to you hereafter.

Respectfully submitted.

S. N. ROGERS,

For Board of Selectmen of Millbury.

TABLES.

[I.]—TABLE NO I.—POUNDS AND WEIRS.—Showing the Catch of each during 1883.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Alwives.	Menhaden.	Mackerel.	Spanish Mackerel.	Bluefish.	Striped Bass.	Scup.	Squeteague.	Tautog.	Flounders and Flatfish.	Eels.
Manchester,	John G. Heath,	31	48,010	-	2,689	24,393	-	1	-	39	-	21	40	-
"	Jones Bros.,	-	12,700	300	6,650	21,505	-	-	-	-	800	-	-	-
Hingham,	Thomas Weston,	-	-	1,975	-	-	-	-	-	-	-	-	-	20
Plymouth,	J. H. Newcomb & Co.,	-	-	-	8,155	35,770	-	-	-	-	-	-	-	-
Sandwich,	T. L. Mayo & Co.,	101	82,300	16,895	26,930	337,224	-	803	-	46	-	446	1,473	-
Barnstable,	W. F. Carney,	74	6,700	1,345	2,004,055	3	-	4	10	2,108	118	8	20	1
Dennis,	Anthony T. Chase,	33	-	6,700	-	77,585	-	272	-	-	-	59	-	-
"	Deep Water Weir Co.,	21	4,500	-	-	56,226	-	10	-	-	-	324	-	-
"	Crowell Weir Co.,	-	1,200	1,800	-	169,067	-	20	-	-	-	51	-	-
"	Notbussett Fish Weir Co.,	3	-	-	-	120	-	2,512	458	-	-	21	-	-
"	Sears Bros.,	2	-	2,320	-	59,113	-	1	-	-	-	-	-	-
Brewster,	Freeman Atwood & Son,	72	-	32	-	5,775	-	819	60	1	-	157	-	2
"	John Bassett,	3	-	300	-	657	-	621	6	-	-	-	-	-
"	Parker & Ellis,	1	-	219	-	5,721	-	324	19	-	-	-	364	-
"	Neil Nelson,	49	32,300	29,910	-	93,626	-	-	-	-	-	159	-	-
"	Z. H. Rogers,	-	500	-	-	1,525	-	343	9	-	-	13	-	-
"	Jeremiah R. Wixon,	35	-	6,530	-	36,733	-	-	-	-	-	56	-	-

TABLE NO. 1. — POUNDS AND WEIRS — Continued.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Alwives.	Menhaden.	Mackerel.	Spanish Mackerel.	Bluefish.	Striped Bass.	Scup.	Squeteague.	Tautog.	Flounders and Flatfish.	Bels.
Chatham,	Andrew Harding & Co., . .	802	123,075	23,482	-	202,872	-	135	-	-	-	-	-	-
"	Middletown Weir Co., . .	885	140,450	98,067	87,254	22,316	-	988	1	79	11	150	2,235	-
"	Reed, Loveland & Co., . .	357	583,900	73,050	15,000	167,031	-	85	1	-	3	-	-	-
Harwich,	J. D. Allen,	177	15,000	8,842	3	3	-	-	-	-	-	-	489	4
"	J. N. Eldredge,	247	-	4,759	21,320	2,038	-	592	2	29,972	27	221	344	1
"	D. F. Weeks & Co., . .	553	19,500	41,030	6,619	-	-	19	18	7	48	52	3,185	-
Hyannisport,	T. F. Phinney,	98	9,827	4,810	560,384	1	2	276	1	22,703	296	24	411	117
Falmouth,	Reuben T. Handy,	12	1,050	17,000	131,058	208	-	198	3	8,616	182	2,702	511	-
"	Prince M. Stuart,	10	-	10,250	1	2,249	-	629	21	68,276	3,238	3,068	4,419	-
"	Wood's Holl Weir Co., *. .	21	-	12,340	-	2,048	-	538	-	69,545	3,376	2,490	728	-
Mattapoisett,	Alexander B. Bowman, . .	-	-	9,225	17,275	-	-	14	-	3,979	22	177	-	-
"	Jerome B. Dunn,	-	-	6,037	13,528	-	-	30	-	7,118	370	157	321	56
"	Dunn & Nye,	-	-	8,567	19,292	2	1	2	4	7,033	212	721	984	14
Gosnold,	Charles C. Allen,	2	-	2,650	11,000	615	3	270	-	113,930	9,479	160	7,219	-
"	Charles C. Church,	1	-	-	202	25	-	62	3	98,989	3,492	267	2,225	-
"	Lewis A. Edwards,	9	30	8,239	65,992	32	2	87	208	50,782	2,937	5	5,352	9
"	C. C. Murphy,	43	-	9,835	58,217	262	-	398	-	23,505	7,419	88	2,229	-

TABLE No. 1. — POUNDS AND WEIRS — Concluded.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Alwines.	Menhaden.	Mackerel.	Spanish Mackerel.	Bluefish.	Striped Bass.	Scup.	Squeteague.	Tautog.	Flounders and Flatfish.	Eels.
South Dartmouth, .	William C. Butts, .	28	-	16,752	15,425	-	3	200	24	9,730	4,598	658	1,547	-
" "	Nicolas Priault, .	7	3,594	13	7,693	-	-	53	29	4,713	1,136	921	2,021	19
" "	Jonas Travers, .	30	7,934	-	32,541	24	-	244	40	19,677	8,350	395	4,258	1
Chilmark, .	R. Flanders & Co., .	-	100	4,815	125	-	-	555	-	27,326	1,100	546	9,789	-
" "	Hiram O. Poole, .	15	-	9,900	2,126	21	-	706	-	76,833	3,703	154	18,105	-
Tisbury, .	C. F. Cleveland, .	9	-	9,668	15,460	-	-	26	12	1,842	384	36	11,612	-
" "	E. S. Cleveland, .	-	-	-	-	-	-	-	-	-	-	-	-	-
" "	Obed S. Daggett, .	155	12,959	-	71,892	107	5	1,654	14	31,808	1,415	126	3,207	-
Nantucket, .	Washington I. Fisher, .	-	-	-	-	-	-	2,400	-	-	-	-	-	-
	Total,	5,994	339,116	1,250,263	4,048,022	4,756,490	246	60,182	2,876	1,848,583	92,671	35,841	184,387	5,361

TABLE NO. II.—SALT-WATER SEINES — Showing the Catch of each during 1883.

TOWN OR PLACE.	PROPRIETOR.										Shad.	Sea Herring.	Alwives.	Menhaden.	Mackerel.	Spanish Mackerel.	Bluefish.	Striped Bass.	Scup.	Squeteague.	Tautog.	Flounders and Flatfish.	Eels.
Newburyport,	138,950	.	.	.	.	.	.	.	.	.
"	768,100	2,871	.	23	.	.	.	.	.	15
Sandwich,	2	510	.	625	102	.	92	.	.	.	46	160	7
Barnstable,	535	.	2,989	.	742	30	.
"	1,865	.	.	.	.	.	.
Centreville,	5,091	.	121	18	11	.	.
Yarmouth,	5	.	1,162	.	.	.	48	3	.	.	.	145	288
Yarmouthport,	9	.	136	150	119	.	933	137	.	.	1	.	.
Brewster,	1,000	.	6,000	.	4,015	.	.	.	575	.	.
West Dennis,	7,444	.	.	.	.	.	.	.	.	.	.
Dennis,	2,138	.	1,126	.	.	.	.
"	1,151	.	.	.	.	.	.
North Truro,	130	.	.	.	.	.	.
Eastham,	1,127	.	2,002	.	.	.	.	.	.
"	884	.	.	.	.	.	.
Orleans,	348	.	277	.	.	.	.	.	.

* Mr. Thurlow also returns 224,400 bluebacks; and in a letter dated Oct. 23 states that from the 10th to 23d, when he stopped fishing, he caught 20,000 menhaden.

TABLE II. — SALT-WATER SEINES — Concluded.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Alewives.	Menhaden.	Mackerel.	Spanish Mackerel.	Bluefish.	Striped Bass.	Scup.	Squeteague.	Tautog.	Flounders and Flatfish.	Eels.
Chatham,	Alpheus Mayo,	.	.	.	.	.	.	693	262	.	.	.	76	.
Hyannisport,	B. F. Lumbert,	.	.	.	.	.	.	2,384	.	85	.	.	.	.
Marion,	Harry Morgan,	.	.	20,479	.	.	.	.	.	.	.	.	.	.
Mattapoisett,	Dunn & Nye,	.	.	.	.	.	4	655	.	.	.	.	.	.
Westport,	Samuel G. Allen,	.	.	4,575	10,357	.	.	.	13	.	.	.	186	25
"	James J. Austin & A. G. Allen,	.	.	2,528	1,940	.	.	.	72	.	5	4	169	51
"	Perry G. Potter,	.	.	2,478	14,401	.	.	.	40	.	.	.	.	4
South Westport,	Charles A. Tripp,	.	.	713	.	.	.	.	.	.	.	.	35	67
Total,	.	19	510	40,515	934,523	10,567	4	22,916	527	4,321	23	804	816	487

TABLE No. III. — GILL-NETS. — Showing the Catch of Each during 1883.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring	Alewives.	Menhaden.	Mackerel.	Spanish Mackerel.	Bluenb.	Striped Bass.	Scup.	Squeteague,	Tautog.	Flounders and Flatfish.	Eels.
Barnstable,	Nathaniel N. Cook,	.	.	.	.	.	.	1,074	.	.	.	.	.	1,100
"	James D. Kelley,	.	.	.	.	.	.	2,703	.	300	.	.	.	.
"	David P. Nickerson,	.	.	.	.	.	.	1,686	.	.	.	40	.	60
"	David Rogers,	.	.	.	.	.	.	4,411	.	32	.	.	187	68
"	Moses Sturges,	.	.	.	.	.	.	560	.	12	.	.	.	.
Centreville,	W. H. Hallett,	.	.	.	.	.	.	2,754	.	6	8	.	.	.
"	Herbert F. Kelley,	.	.	.	.	.	.	2,640	.	139	8	.	.	.
Dennis,	Zenas H. Baker,	.	.	.	.	.	.	742	.	1	.	.	.	.
"	Francis Joseph,	.	.	.	.	.	.	100	.	.	.	.	.	.
"	Venney Kelley,	.	.	.	.	.	.	1,903	.	.	.	.	.	.
Brewster,	James Eldredge,	.	.	.	.	.	.	628	5	.	.	.	.	.
Wellfleet,	W. F. Pierce,	.	25,450	400	.	842	.	2,297	.	.	.	.	.	.
"	Heman S. Rogers,	.	.	.	.	248,783	.	2,104	.	.	.	.	.	.
Tauro,	Richard S. Chandler,	.	.	.	.	2,000	.	25	.	.	.	.	.	.
"	Benjamin Coan,	.	.	.	.	1,185	.	433	.	.	.	.	.	.
"	Caleb M. Crozier,	.	.	.	.	1,770	.	373	.	.	.	.	.	.
"	Isaac Smith,	.	.	.	.	2,783	.	381	.	.	.	.	.	.

TABLE No. III. — GILL-NETS — Continued.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Alewives.	Menhaden.	Mackerel.	Spanish Mackerel.	Bluefish.	Striped Bass.	Scup.	Squeteague.	Tautog.	Flounders and Flatfish.	Hels.
Truro, . . .	Edwin P. Worthen, .	.	.	.	.	.	1,680	.	.	.	.	.	.	.
Provincetown, .	James F. Atkins, .	.	.	.	.	.	4,226	566	.	.	.	.	.	.
" . . .	D. W. Atwood, .	.	.	.	.	.	-	5,006	.	.	.	.	4,875	.
" . . .	Paul L. Bangs, .	.	.	.	.	.	2,000	802	.	.	.	.	.	.
" . . .	J. M. Caton, .	.	.	.	.	.	1,840	-	.	.	.	.	.	.
" . . .	Nathaniel N. Cook, .	.	.	.	.	.	-	1,074	.	.	.	.	.	.
" . . .	J. B. Dyer, .	.	.	.	.	.	548	97	.	.	.	.	.	.
" . . .	John O. Donald, .	.	40,000	.	.	.	900	-	.	.	.	.	.	.
" . . .	Manuel Francis, .	.	.	.	.	.	4,954	1,231	.	.	.	.	.	.
" . . .	George W. Freeman, .	.	.	.	.	.	6,994	662	.	.	.	.	.	.
" . . .	Hatsuld Freeman, .	.	.	.	.	.	1,485	329	.	.	.	.	.	.
" . . .	John Freeman, .	.	.	.	.	.	357	-	.	.	.	.	.	.
" . . .	Prince Freeman, .	.	4,225	.	.	.	2,983	1,089	.	.	.	.	.	.
" . . .	John Ghenn, .	.	.	.	.	.	712	318	.	.	.	.	.	.
" . . .	S. H. Ghenn and R. Atkins, .	.	.	.	.	.	-	1,579	.	.	.	.	.	.
" . . .	John C. P. Harvender, .	.	1,343	21	.	.	21,847	-	.	.	.	.	399	.
" . . .	Levi B. Kelley, .	.	.	.	.	.	1,372	436	.	.	.	.	.	.

TABLE No. III. — GILL-NETS — Continued.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Alewives.	Menhaden.	Mackerel.	Spanish Mackerel.	Bluefish.	Striped Bass.	Sculp.	Squeeague.	Tautog.	Flounders and Flatfish.	Eels.
Eastham,	J. Q. Hopkins, .	.	.	.	.	.	.	2,168	.	.	.	23	.	40
"	James Penniman, .	.	.	.	.	.	.	3,865	.	.	27	.	.	.
Orleans,	W. A. Smith, .	.	.	.	.	1,175	.	.	.	.	.	.	.	.
Chatham,	Jesse Gill, .	.	.	.	.	1,392	.	.	.	.	.	.	.	.
"	Horatio Howes, .	.	.	.	.	.	.	633	302	.	.	.	.	.
"	William Patterson, .	.	.	.	.	1,000	.	.	.	.	.	.	.	.
"	J. F. Smith, .	.	.	.	.	1,553	.	.	.	.	.	.	.	.
Hyannis,	David Bearse, .	.	.	.	.	.	.	1,557	.	.	15	.	.	.
Marion,	Benjamin Bowditch, .	.	.	.	.	.	.	300	.	.	.	.	.	.
"	George E. Leonard, .	.	.	.	.	.	.	1,490	.	.	.	.	.	.
"	M. B. Marble, .	.	.	.	.	.	.	1,953	.	.	35	.	.	.
"	Harry Morgan, .	.	.	.	.	.	.	2,970	.	.	62	.	.	.
"	Marion T. Sylvia, .	.	.	.	.	.	.	244	.	.	43	.	.	.
Mattapoisett,	Alexander B. Bowman, .	.	.	.	.	.	.	485	.	.	109	.	.	.
Fairhaven,	J. C. & J. J. Allen, .	.	.	.	.	.	.	610	.	27	20	.	.	.
"	Robert Blythe, .	.	.	.	.	.	.	4,165	.	.	77	.	.	.
"	Samuel P. Dunn, .	.	.	.	.	.	.	368	.	100	17	.	.	.

[illegible]

* Mr. Snow's returns include both gill-net and seine, and he also reports 3 bonito and 16,500 perch.

TABLE NO. IV. — CONNECTICUT RIVER SEINES.

TOWN OR PLACE.	PROPRIETOR.	Shad.
South Hadley, . . .	C. C. Smith and others,	3,099
Chicopee,	F. W. Chapin,	422
Agawam,	A. Converse,	38
"	A. J. Hills,	32
	Total,	3,591

TABLE NO. V. — MERRIMAC RIVER SEINES.

TOWN OR PLACE.	PROPRIETOR.	Shad.
North Andover, . . .	Eben Sutton,	89
Amesbury,	Jonathan Morrill,	57
	Total,	146

TABLE NO. VI. — TAUNTON RIVER SEINES.

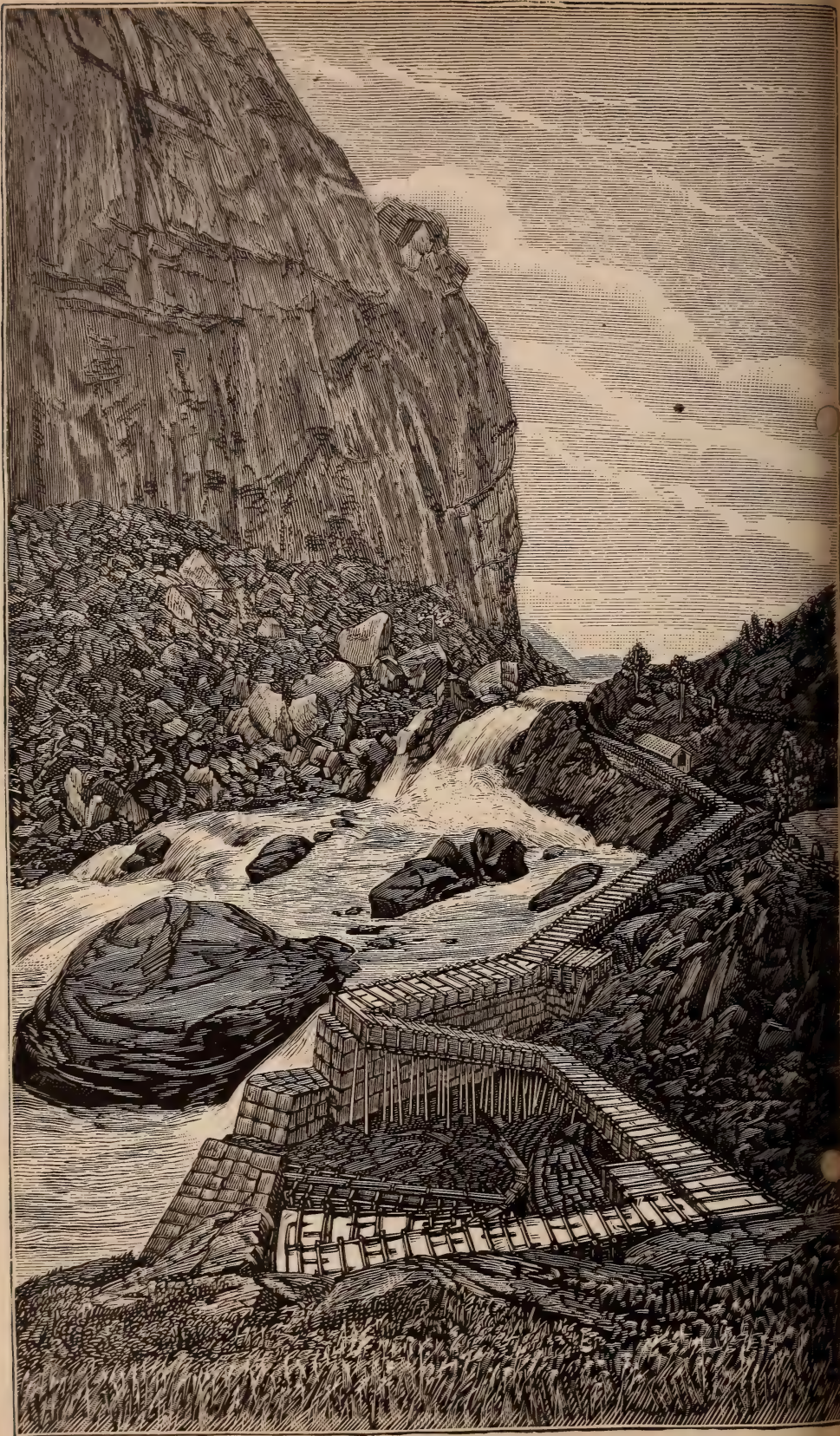
TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Striped Bass.
Raynham,	J. S. Townsend & Bro., . . .	784	89,835	-
"	George B. Williams, . . .	315	126,900	-
"	George B. & Edwin Williams,	333	130,991	-
Middleborough, . . .	L. M. Alden,	-	139,153	-
Taunton,	J. W. Hart & Co,	281	95,100	-
Dighton,	E. & O. M. Buffington, . .	750	100,000	-
"	Edmund Hathaway, . . .	697	110,400	294
"	Charles N. Simmons, . . .	800	120,000	-
Berkley,	Isaac N. Babbitt,	850	144,809	-
Somerset,	J. B. Hathaway and others, .	200	50,000	-
"	George H. Simmons, . . .	2	16,294	-
	Total,	5,012	1,123,473	294

TABLE NO. VII.— OTHER FRESH-WATER SEINES AND DIP-NET FISHERIES.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Striped Bass.	Frostfish.
Weymouth,	Weymouth Iron Co.,	-	154,300	-	-
Kingston, .	Philander Cobb,	-	38,325	-	-
Plymouth, .	E. & J. C. Barnes,	-	47,152	-	-
" .	William S. Hadaway,	-	-	-	27,000
" .	B. F. Hodges,	25	36,132	2	-
"	J. H. Newcomb & Co.,	360	2,965	-	-
Barnstable, . .	R. Marston & Co.,	-	42,850	-	-
Centreville, . .	Eli Phinney & Co.,	-	80,000	-	-
Yarmouth,	David S. Baker,	-	8,713	-	-
" .	N. W. Grush,	-	268,089	-	-
"	Long Pond Fishing Co.,	-	2,478	-	-
Brewster, . . .	J. Howard Winslow,	-	244,607	-	-
Wellfleet, . . .	Warren Newcomb,	-	162,861	-	-
Marshpee, . . .	Matthias Amos,	-	19,718	-	-
"	David Lovell,	-	5,960	805	-
"	W. R. Mingo,	-	25,230	-	-
Wareham, . . .	George Sanford,	-	463,200	-	-
Marion,	Hammond & Sisson,	-	1,600	-	-
Mattapoisett, . .	A. H. Shurtleff,	-	131,710	-	-
Westport, . . .	C. V. S. Remington,	-	10,000	-	-
"	Philip S. Tripp,	6	5,066	264	-
"	Lysander W. White,	-	1,261	1	-
Chilmark, . . .	Estate H. H. Smith,	-	10,733	-	-
Total, . . . .	. . . . .	391	1,762,950	1,072	27,000

TABLE No. VIII. — *Comparison of Returns for the Years 1882 and 1883.*

YEAR.	FISHERIES.		Shad.	Sea Herring.	Alewives.	Menhaden.	Mackerel.	Spanish Mackerel.	Bluefish.	Striped Bass.	Scup.	Squeteague.	Tautog.	Flounders and Flatfish.	Eels.
	Kind.	Num-ber.													
1882,	Pounds and weirs,	85	27,769	1,201,449	1,420,919	8,102	3,289,512	310	133,805	4,219	1,991,480	67,266	40,512	114,843	4,016
1883,	" "	87	5,994	339,116	1,250,263	4,048,022	4,756,490	246	60,182	2,876	1,848,583	92,671	35,841	184,387	5,361
1882,	Sea seines,	33	1,222	20,005	186,321	10	23,717	6	54,963	1,280	53,975	839	2,321	1,784	2,936
1883,	" "	24	199	510	40,515	934,523	10,567	-	22,916	527	4,321	23	804	816	487
1882,	Gill nets,	100	516	290,606	238,309	623	563,370	81	136,705	147	45,071	3,366	3,924	31,703	97
1883,	" "	88	7	79,179	1,481	3,104	381,968	-	108,899	311	1,933	1,079	162	11,865	1,268
1882,	Conn. River seines,	3	2,770	-	-	-	-	-	-	-	-	-	-	-	-
1883,	" "	4	3,591	-	-	-	-	-	-	-	-	-	-	-	-
1882,	Merrimac River seines,	4	387	-	2,800	-	-	-	-	1	-	-	-	-	-
1883,	" "	2	146	-	-	-	-	-	-	-	-	-	-	-	-
1882,	Taunton River seines,	11	11,173	-	1,039,272	-	-	-	-	44	-	-	-	-	-
1883,	" "	11	5,012	-	1,123,473	-	-	-	-	294	-	-	-	-	-
1882,	Other fresh-water seines,	25	897	-	1,558,659	-	-	-	-	238	-	-	-	-	-
1883,	" "	23	391	-	1,762,950	-	-	-	-	1,072	-	-	-	-	-
1882,	Total,	261	44,734	1,512,060	4,446,280	8,735	3,876,599	397	325,473	5,929	2,090,526	71,471	46,757	148,330	7,049
1883,	Total,	239	15,160	418,805	4,178,682	4,985,649	5,149,025	250	191,997	5,080	1,854,837	93,773	36,807	197,068	7,116
1882,	Increase,	-	-	-	-	4,976,914	1,272,426	-	-	849	235,689	22,302	9,950	48,738	67
1883,	Decrease,	22	29,574	1,093,255	267,598	-	-	147	183,476	-	-	-	-	-	-



Fishbush on River Sira, Norway

NINETEENTH ANNUAL REPORT

OF THE

COMMISSIONERS

ON

INLAND FISHERIES,

FOR THE

YEAR ENDING DECEMBER 31, 1884.

BOSTON:

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1885.



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Commonwealth of Massachusetts.

To His Excellency the Governor and Honorable Council.

The Commissioners on Inland Fisheries beg leave to present their Nineteenth Annual Report.

FISHWAYS.

The fishway at Middleton, on the Ipswich River, was completed last May. That at Willowdale was not built in accordance with the plans furnished, and will require some alteration.

No fishway has yet been built at the second dam on the Acushnet River. The case is still pending in court.

The Lawrence fishway has been thoroughly repaired during the fall, and is in excellent condition.

Some repairs will be needed on the fishway at Holyoke next season.

In the appendix will be found a description, with illustrations, of the fishways on the river Sire by A. Landmark, Government Inspector of Fisheries of Norway.

REPORT OF THOMAS S. HOLMES, SUPERINTENDENT OF THE LAWRENCE FISHWAY: FISH SEEN IN THE LAWRENCE FISHWAY IN 1884.

- May 6. (The first fish), alewives and suckers, run moderate.
7. Alewives, suckers and chubs, run small.
8-9. No fish.
10. A few alewives and suckers.
11. A few alewives and suckers.
12. A few alewives and suckers.
13. A few alewives.
14. A few alewives and suckers.
15. Alewives and suckers, run small.
16. Alewives and suckers, run small.
17. Alewives and suckers, run small.
18. Alewives, run small.
19. Alewives, run moderate; suckers, run small.

- May 20. Lampers, run moderate; alewives and suckers, run small.
 21. Alewives, run moderate; lampers and suckers, run small.
 22. Lampers and suckers, run small (river has risen, muddy).
 23. Lampers and suckers, run small (water very muddy).
 24. Lampers and suckers, run small.
 25. Lampers, suckers and alewives, run small.
 26. Lampers, run moderate; suckers and alewives, run small.
 27. Alewives, run large; lampers, run moderate.
 28. Lampers, run large; alewives and suckers, run small.
 29. Lampers, alewives and suckers, run small.
 30. Lampers, alewives and suckers, run small.
 31. Lampers, alewives and suckers, run small.
- June 1. Lampers, alewives and suckers, run small.
 2. Lampers, run large; alewives and suckers, run small.
 3. Lampers and suckers, run large; alewives, run small.
 4. Lampers, run large; suckers, run small.
 5. Lampers and suckers, run small; a few red-fin shiners.
 6. Lampers, suckers and chubs, run large.
 7. Lampers, suckers and chubs, run large.
 8. Lampers, alewives and suckers, run moderate.
 9. Alewives and suckers, run large; lampers, run moderate.
 10. *One salmon*, 6 pounds; lampers, suckers and alewives, run moderate.
 11. *Three salmon*, 12 to 20 pounds; lampers, suckers and alewives, run small.
 12. Lampers, run moderate; suckers and alewives, run small.
 13. *One salmon*, 14 pounds; lampers and suckers, run small.
 14. Lampers, suckers and small silver eels, run small.
 15. Lampers, suckers and small silver eels, run small.
 16. Lampers, suckers and small silver eels, run small.
 17. *Two salmon*, 10 to 20 pounds; lampers and suckers, run small.
 18. Lampers and small silver eels, run small.
 19. *One salmon*, 14 pounds; lampers and small silver eels, run small.
 20. Lampers and small silver eels, run small.
 21. Lampers and silver eels, run small.
 22. Lampers and silver eels (mostly small ones), run small.
 23. Lampers, suckers and silver eels, run small.
 24. *One salmon*, 15 pounds; a few lampers and small silver eels.

During the rest of the month of June suckers, in small numbers, and a good many small silver eels, were all the fish seen in the fishway.

In July small silver eels, in large numbers, with now and then a large one, and a few suckers, were all the fish in the fishway. The water was shut out of the fishway about a third part of the time because the river was low.

Silver eels and suckers were the only fish in the fishway in August. Water was shut out of the fishway the last half of the month.

Water was shut out of the fishway, excepting Sundays, in September until the 23d; the fall run of fish commenced on the 24th, and was as follows:

Sept. 24. *One salmon*, 12 pounds; a few suckers.

25. }
26. } No fish.
27. }
28. }

29. *One salmon*, 14 pounds; a few suckers.

30. *Two salmon*, 12 to 14 pounds.

Oct. 1. *One salmon*, 12 pounds.

2-13. No fish.

14. *One salmon*, 10 pounds.

15. No fish.

16. *One salmon*, 14 pounds.

17-21. No fish.

22. *One salmon*, 12 pounds.

No fish after the 22d to the end of the month, when water was shut out.

SHAD HATCHING AT NORTH ANDOVER

Was continued during the past season. As was expected there was a still further falling off of the spawning fish, sufficient time not having elapsed for the young; hatched the two previous years, to mature. It being desirable to return alive to the water, all shad not used for spawning, a net with a mesh of two and a half inches was used to prevent gilling them. This was effective; not only were no salmon killed, but very few shad were injured, and its use led to important information regarding the two previous years' hatching. It was found that in the river at North Andover were large numbers of young shad, one and two years old; sometimes a hundred or more would be taken at one sweep of the seine with scarcely any mature fish among them. These small shad were all males. As has been heretofore stated, females do not ascend the river until they are three or four years old, or until they are sufficiently mature to spawn. The milt in shad and salmon is ripe at the age of one and two years. With the enforcement of the law prohibiting the use of small mesh seines in the coves and eddies on the lower part of the river, and the continuation of the hatching at North Andover, there is every reason to warrant the con-

clusion that a large increase in the shad fisheries of the Merrimac may be secured. A small increase may be expected in 1885, and a still larger the following year.

To the Commissioners on Inland Fisheries.

GENTLEMEN: — We respectfully submit the following report, showing the full details of the work of hatching shad at North Andover, for the season of 1884. The hatchery was opened June 10th, and closed July 5th.

Number of shad taken,	166
“ returned to river alive,	74
“ given away,	92
“ males,	132
“ females,	34
“ salmon taken,	9
“ returned to river alive,	9

From the above table it will be seen that a large percentage of the fish taken were males. Of the 34 females, only 20 were found to be in condition to furnish spawn, and from this number 268,000 spawn were taken. The number of shad hatched was about 252,000. These were turned into the river at North Andover. Owing to the short supply, no young fish were sent to the New Hampshire Commissioners, as in former seasons. The average cost to the State, for hatching shad at North Andover, for the last three seasons, has been a fraction less than 38 cents per thousand. The following table will show the number of fish taken each day, the time of drawing the seine, the temperature of the water and air, the proportion of males to females, also the number of fish taken at each sweep, and the estimated amount of spawn taken.

1884.	Shad taken.	Males.	Females.	Temperature of Water at 7 p.m.	Temperature of Air at 7 p.m.	Time of hauling seine.	Fish per sweep.	Estimated amount of spawn taken.
June 11, .	11	11	0	68	62	7, p.m.	11	000
" 12, .	15	11	4	68	70	7, 8, "	8, 7	30,000
" 13, .	4	4	0	68	66	7, 8, "	1, 3	000
" 14, .	5	2	3	69	61	7, 8, "	2, 3	000
" 16, .	2	1	1	69	68	6, 7, 9, "	0, 2, 0	20,000
" 17, .	19	16	3	71	71	7, 8, 9, "	3, 10, 6	30,000
" 18, .	13	10	3	73	73	7, 8, "	2, 11	30,000
" 19, .	5	4	1	74	72	7, 8, "	0, 5	10,000
" 20, .	18	17	1	76	72	7, 8, 9, "	10, 5, 3	10,000
" 21, .	13	11	2	80	76	7, 8, 9, "	8, 3, 2	30,000
" 23, .	15	12	3	76	65	7, 8, 9, "	2, 7, 6	35,000
" 24, .	4	3	1	78	69	8, 9, "	1, 3	15,000
" 25, .	5	3	2	79	68	7, 8, "	2, 3	10,000
" 26, .	5	3	2	76	70	7, 8, 9, "	3, 2, 0	000
" 27, .	2	0	2	74	67	8, 9, 10, "	1, 1, 0	000
" 28, .	4	4	0	74	68	7, 8, 9, "	2, 2, 0	000
" 30, .	7	5	2	77	70	7, 8, 9, "	2, 3, 2	30,000
July 1, .	4	3	1	79	70	8, 9, 10, "	2, 0, 2	8,000
" 2, .	5	4	1	79	69	7, 8, 10, "	2, 3, 0	000
" 3, .	8	6	2	79	68	7, 8, 9, "	3, 3, 1	10,000
" 5, .	2	2	0	78	70	7, 8, "	0, 2	000

During the fishing season of only three weeks, thousands of young shad were taken, and of course returned to the water alive. The return of the young shad to the Merrimac in such large numbers is, to say the least, an indication of good results from the work of hatching. No perceptible increase of mature shad can reasonably be expected until the season of 1885, and perhaps a year later, as a great many of those hatched in 1882 were undoubtedly destroyed at the mouth of the river. The Act of the Legislature prohibiting the use of fine mesh seines is certainly a step in the right direction; for if it is desirable to be successful in fish culture, one thing must not be lost sight of, viz., the protection of the young fish.

The restocking of a stream in the exhausted condition of the Merrimac, is a work not to be accomplished in a moment. It requires thought, time, patience and money.

B. P. CHADWICK.

EDWIN F. HUNT.

CARP.

Through the kindness of Prof. Spencer F. Baird, U. S. Commissioner of Fish and Fisheries, four thousand young carp were forwarded to this State for distribution, arriving here about Nov. 9, 1883.

There were applications enough on file to have taken all

these fish, but although the parties were notified that the fish were ready for delivery, many were not sent for, and a considerable number were lost in consequence of not having a proper place to keep them. They do not thrive in tanks supplied with spring water, and they could not have been kept well in any other place, subject to the orders of applicants. Notwithstanding all that has been said in former reports, more than half of the persons applying for them were without suitable ponds. It was to be hoped that a fish so easily cultivated, and apparently of considerable value in many parts of the country, would receive more attention. Its cultivation in Southern and Western States is rapidly increasing. While they may not, in this climate, make the phenomenal growth attributed to them in some of the States, the lower temperature of the water will probably enhance their value as edible fish. The time will come when not only the farmer will find it profitable, but gentlemen owning estates will consider them incomplete without a well-arranged carp pond. If persons having suitable ponds for these fish will send in their orders for them before the first of September, they can be filled about the last of October, with no expense except transportation. Carp were delivered to the following persons in 1883:—

John F. Wild, .	Wilmington.	F. S. Bennet, .	Tyngsboro'.
A. W. Austin, .	Boston.	Geo. D. Danforth, .	Tyngsboro'.
Nathan Keith, .	Campello.	F. A. Stimson, .	Rockport.
H. Goulding, .	So. Natick.	M. H. A. Evans, .	Graniteville.
W. H. P. Wright, .	Lawrence.	H. W. Phelps, .	Springfield.
J. T. Mosher, .	Squibnocket.	E. Rude, .	Huntington.
C. E. Gould, .	Leominster.	O. W. Fiske, .	Bedford.
G. P. Dwight, .	Dunstable.	J. B. Batchelder, .	Hyde Park.
Geo. Bradshaw, .	Springfield.	E. T. Kent, .	Malden.
Benj. F. Bee, .	Harwich.	W. P. Hood, .	Melrose.
Edw'd Gillett, .	Southwick.	B. Morse, .	E. Douglas.
T. H. Meek, .	E. Douglas.	— Messenger, .	Boston.
J. Dyer, .	Truro.	Miss S. L. Gray, .	Andover.
O. K. Rice, .	Ayer.	J. L. S. Thompson, .	Lancaster.
J. A. Harwood, .	Littleton.	Enoch Foster, .	Tewksbury.

TROUT.

We received from the works at Plymouth, N. H., about one hundred and twenty-five thousand (125,000) trout spawn,

which were hatched with very little loss. These would have filled the orders on hand, had it not been for the mischievous action of some boys, who broke the windows at the head of the tank, and endeavored to feed the fish by throwing in several handfuls of orange peel, which caused a loss of about fifty thousand young fish. The effort to restock our depleted trout streams has thus far been successful, the only drawback being the small number distributed to each applicant. The amount of spawn for this year will be greatly in excess of last season, and all orders can probably be liberally filled. The trout and landlocked salmon fry are delivered free at the hatching-house, Winchester, Mass. Cans necessary for their transportation will be loaned to all applicants, on condition that they are immediately returned.

Distribution of Young Trout.

	CANS
F. Dimond, No. Carver,	1
D. Fisk, Upton,	1
A. Barrus, Goshen,	2
H. Goulding, So. Natick,	2
M. Ryson, Foxborough,	1
Wm. H. Little, Sheffield,	2
J. Alden, Stoneham,	1
G. F. Newbegin, Salem,	1
H. C. Stark, Hyde Park,	1
A. H. Manning, Pittsfield,	1
J. O. Parker, Methuen,	1
J. Cummins, Woburn,	1
H. H. Wyman, Winchendon,	1
Aug. Fels, Lowell,	1
J. A. Loring, Boston,	4
J. B. Hull, Stockbridge,	2
P. Aldrich, Boston,	1

NOTE. — There may be some discrepancies in these lists of fry delivered at the hatching-house, arising from the haste occasioned by frequently having to deliver several lots for the same train.

LAKE SUPERIOR SALMON TROUT.

One hundred thousand spawn of these fish were received and hatched, with little loss, and distributed as follows: —

	CANS.
D. Fisk, Upton,	1
J. D. Francis, Pittsfield,	1

	CANS.
J. B. Hull, Stockbridge,	3
T. Lawrence, Falmouth,	4
J. F. Hinds, Webster,	2
A. C. Brigham, So. Abington,	2
H. C. Stark, Hyde Park,	1
M. Gifford, Falmouth,	4
A. H. Manning, Pittsfield,	1
H. H. Wyman, Winchendon,	1
J. O. Parker, Methuen,	1
C. G. Reed, Worcester,	1
M. Palmer, Groton,	1
C. E. Peck, Wilbraham,	2

LANDLOCKED SALMON.

The following report of Mr. Hodge, Commissioner of New Hampshire, shows that the introduction of this fish in that State has been a decided success. Similar reports have been received from some of the ponds in Connecticut. It is to be regretted that so little information upon the subject has been received from the leased ponds in this State:—

The habits and haunts of these fish are such that they may exist in considerable numbers in a pond or lake without the public being aware of it. Their presence in New Hampshire and the northern part of Connecticut would be more likely to be known than in the waters here, for hundreds of expert fishermen who understand how to catch this fish, annually visit those States, having ample time for investigating and exploring every stream and lake. If there is any fish in New Hampshire that has not made the acquaintance of some one of this great army of anglers, he ought to be considered unfit for the table.

The regulations governing leased ponds in this State require that, for the present, all landlocked salmon shall be returned to the water alive. The temptation to retain so remarkable a fish may possibly have had some effect on the returns.

Of the ponds where these fish have been introduced, only fifteen have reported any catch. In some of the waters most favorable for their growth, they have not been introduced sufficiently long to expect, as yet, any favorable results. As a rule they do not make their appearance until the third or fourth year after planting. The following list shows the

distribution of these fish for 1884. The number of fish in a can, of course, varied somewhat, according to the temperature and the distance to be carried.

	CANS.
Thomas Lawrence, Falmouth,	6
Charles G. Reed, Worcester,	7
J. B. Hull, Stockbridge,	3
Henry A. Boyden, Sharon,	2
C. E. Peck, Wilbraham,	2
Meltiah Gifford, Waquoit,	4
John F. Hinds, Webster,	2
E. S. Thayer, Salem,	8
W. A. Bullard, Cambridgeport,	6
A. H. Manning, Pittsfield,	3
E. Howes, Gloucester,	2
S. P. Keyes, New Marlborough,	4
Luther Hill, Spencer,	2
B. P. Chadwick, Bradford,	1
H. H. Wyman, Winchendon,	4
J. O. Parker, Methuen,	2
Moses Palmer, Groton,	1
C. E. Gould, Leominster,	2

Mystic Pond, Medford and Winchester, 20,000 fry.

PLYMOUTH, N. H., Dec. 8, 1884.

E. A. Brackett.

MY DEAR SIR:—In answer to your question as to the result of the introduction of the landlocked salmon or the Schoodic salmon, I am happy to say that we consider them a success and a great addition to our game fishes; good reports are being received from various parts of the State.

In some waters their growth has been remarkable, particularly in Squam and Sunapee lakes. The first plant in Squam Lake was made in 1877. In June, 1880, a salmon was taken in the outlet that weighed $6\frac{1}{2}$ pounds; another measured 27 inches in length, weight not taken.

In November, 1883, six years after the lake was stocked, a pair, male and female, were speared on their spawning bed, weighing 10 and 15 pounds each. This last spring another was caught, $9\frac{1}{2}$ pounds. I only give you the first that I know were weighed; many others, fully as large, have been reported.

In Sunapee, first stocked in 1877, they have done fully as well. In 1882 and 1883, salmon were taken weighing $6\frac{1}{2}$, $7\frac{1}{2}$ and $8\frac{1}{2}$ pounds, and others of 5 and 6 pounds. The largest taken this year, that I have a record of, weighed $11\frac{1}{2}$ pounds. This was a

female fish. I could give you many other instances of the reported capture of large landlocked salmon, but the above is enough to show that they are a success in this State.

In some of the small lakes they have not done as well, while in others, no larger, they have been a success. This result might have been expected, as the young fry were introduced into the various ponds and lakes without any examination of the water to ascertain whether it contained suitable food for the young fry, or whether the water was of sufficient depth for the adult fish.

I am, respectfully, yours,

E. B. HODGE.

SALMO SALAR.

The distribution of young salmon is detailed in the following report by Mr. E. B. Hodge, Commissioner of New Hampshire and superintendent of the works at Plymouth, carried on jointly by the two States.

The effort to stock the Merrimac with California salmon, mainly on account of the cheapness of the spawn and the more rapid growth of that fish, was a failure. This, with the large number of breeding fish unlawfully destroyed by the fishermen below Lawrence, four years ago, retarded the stocking of the river for several years. This has now been bridged over, and a much more rapid increase of salmon may be expected hereafter. There have been three seasons of remarkably low water in the river, which has greatly interfered with the salmon reaching their spawning grounds. According to records kept at Lowell, it is probable that this drouth will be followed by three or four years of abundance.

The fall run of salmon this year was unusually large, indicating an increased run for next season. The works at Plymouth are being extended and greatly improved.

To the Commissioners on Inland Fisheries for the Commonwealth of Massachusetts:

After my report to you of Nov. 26, 1883, I received in January, from Bucksport, Maine, 550,000 Penobscot salmon eggs, 350,000 of which was the share belonging to Massachusetts from the Penobscot salmon-breeding establishment; 200,000 were given by Prof. S. F. Baird, U. S. Fish Commissioner. These, with the eggs

taken from the salmon caught in the Pemigewasset, making over 600,000, were hatched, with a very small loss (less than one and one-half per cent.), and the young fry were planted in the Pemigewasset River in June; 250,000 were placed in the east branch of the Pemigewasset, at the terminus of the P. V. R. R. in North Woodstock, some twenty miles above the hatchery; the remainder, in lots of 50,000, at various points from two to fifteen miles above the falls. This is largest plant by nearly 200,000 that has yet been made in the head-waters of the Merrimac.

The spring run of salmon was about the same as last year. Unfortunately, the water was so low in September that none of the fall run, which I understand was unusually large, reached here. The salmon taken this season were all large fish, weighing from fifteen to thirty-five pounds.

As usual, the young salmon were very plenty in the river this season. They begin to leave this part of the river the last of August, and by the first of October very few can be found, and they are male fish, from five to seven inches in length, with the milt fully developed.

There are now in the hatchery 380,000 eggs of the brook trout, and, when all taken, there will be about 400,000, of which I shall send you one-half as soon as they will do to move.

As instructed, at the annual meeting of the Massachusetts and New Hampshire Commissioners, I have added 5,000, from four to eight inches in length, to the stock of breeders, which will, another year, add materially to the number of eggs. I have built a pond, 18 by 60, to accommodate the small trout; the sides are planked thirty inches above the water. The small pond at the head of the old trout tanks has been enlarged, planked and graded. I find it necessary to have the sides of the ponds planked to prevent mink from destroying the trout.

Respectfully yours,

E. B. HODGE, *Superintendent.*

PLYMOUTH, N. H., Dec. 8, 1884.

FISHERIES ON THE LOWER MERRIMAC.

In the last two reports the cause of the decline of shad in the Merrimac was fully set forth. As the statements therein made were the result of a thorough investigation, extending over a series of years, there seemed to be no doubt that this depletion was largely due to the small mesh seines used at the mouth of the river for taking bait. It was therefore

recommended that no seine of less than two and a quarter inches be allowed for that purpose. This was accepted by the last Legislature, and the only argument used against its passage was that it would reduce the fishermen to a state of poverty little better than starvation. The fact that none of these fishermen are dependent on the use of their seines for a living was ignored.

As it has always been the earnest desire of the Commissioners to give all fishermen the largest possible liberty in fishing consistent with the preservation of their interests, at the suggestion of several of the leading citizens of Newburyport, a meeting of the fishermen was called for the purpose of consultation and to find out how far they had been injured by restricting them to a larger mesh seine. It was claimed by these gentlemen that the fishermen were laboring under a misapprehension, and that they had already received all, if not more, than they could reasonably expect, and that an explanation from the Commissioners would be likely to lead to a better understanding of the case, and probably remove all unpleasant feelings on the part of the fishermen. The meeting was held on the 24th of June, and the following statement, made in the "Newburyport Herald" by one of its reporters, who was present, is substantially correct:—

"A social conference between Commissioner Brackett and the ward one fishermen was held at the home of Deputy Commissioner Hunt, last evening, the object being to arrive at a better understanding on the part of fishermen and commissioner, relative to the various phases of the local fishery laws. All the seining crews were represented, and to the first question of Mr. Brackett, as to whether the fishermen had really been injured by being forced to use a $2\frac{1}{4}$ -inch mesh, all substantially agreed that they had not; all freely admitted that the $2\frac{1}{4}$ mesh let the smaller fish slip through, but held the larger and to them more valuable fish. Mr. Brackett said that he had believed this to be the case after extensive conversation among fishermen elsewhere, and for that reason had favored the $2\frac{1}{4}$ mesh. He also said that the commissioners had no desire whatever to crowd the fishermen; they only asked for square dealing and compliance with the law on their part, and were willing to do everything within the law that would prove of benefit to them in return. Regarding the issuing of permits to catch sea shad, he said that the resolution relating to it, which had become a law, was

written by himself, and was purely a voluntary act on his part in the interests of the fishermen. These permits he had authorized Deputy Hunt to issue, subject to the discretion of the latter, and with the distinct understanding that Mr. Hunt, at all times, is to have the privilege of looking over the nets, and examining the fish caught, to see that the law is not violated by the catching of river shad, salmon and other prohibited fish. The men agreed to this, and Mr. Brackett suggested that a record of all fish caught should be kept, that the value of the industry might be easily computed at the end of the season. He also said that if the men had a grievance at any time, it would be better for them to confer with the commissioners, and by that means all difficulties could be more easily adjusted, than by running to the legislative committees. The men all appeared pleased to meet Mr. Brackett, and the meeting closed with a hearty expression of friendly feeling on both sides. The spokesman of the seiners, after the meeting, said it had been a good thing for the fishermen, who had been led to believe that the commissioners had a disposition to crowd them, whereas they were trying to protect the river fish, and at the same time allow the fishermen every privilege which could possibly be allowed by the law."

Mr. Caswell, one of the leading seiners, stated that he had, in times past, taken large quantities of small fish for bait, so small that the vessels refused to accept them, and he was obliged to throw them away. If they had been allowed to grow they would have been valuable. He thought the law a good one, and in the interest of the fishermen.

SEA SHAD.

Permission was given to take these fish, and about seven thousand were caught. They were all the true shad. A careful examination showed that only one of this large number had well developed spawn. In all the others the spawn and milt were so small as to preclude the possibility of their spawning before another season. The prevailing opinion is that these fish have spawned in more southern waters, and in moving north along the coast, occasionally run into the mouths of our rivers. So far as we know, this theory is not based upon any well-authenticated facts. Possibly the solution of this question may be found in another direction. Within a few years it has been definitely settled that the

Atlantic salmon spawn only every other year, and should it be proven that the same law holds good with the shad, it might account for the appearance of these fish at the mouth of the river at the time when the ripe fish are seeking their spawning grounds. In the sea, shad move in schools, and on reaching the mouths of the rivers to which they belong, only those ready to spawn go up; the others may loiter for a few days in the brackish water. From testimony obtained during the last season, it is probable that a small school of these fish may be found annually, in the month of June, inside of Plum Island Light, and that this school is distinct from the phenomenal movement described in the last report. Until something more definite is known about them, it cannot be determined whether these fish belong to the Merrimac or to some other river.

In considering the fisheries of the lower part of the Merrimac, it is important to understand that the present arrangement is, in part, a compromise, reached after a thorough discussion by both sides, for the two and one-quarter mesh will necessarily destroy more or less young shad. In reaching this settlement there have been expensive hearings, some legislation, and a great deal of unnecessary debate. The interest of the State has been fairly preserved, and the fishermen express themselves satisfied with the results. So long as they adhere to this, there seems to be no good reason for any further conflict. There were no menhaden in the river this summer, and the total amount of fish taken for bait did not exceed 350 barrels, valued at \$440.

NEWBURYPORT, NOV. 10, 1884.

E. A. Brackett, Chairman of Board of Commissioners on Inland Fisheries:

I regret to say, that owing to the absence of menhaden in the river, the past season has not been a prosperous one for the fishermen.

The fishing commenced the 20th of June, with four seines, owned as follows: John Janvrin, W. H. H. Perkins, Charles Caswell & Co., and Ezra Thurlow & Co. The catch for the season was: bait, 350 barrels, valued at \$440; sea shad, 7,000, valued at \$300; total value, \$740. This was divided among some thirty fishermen, according to their interest in boat and seine. Had it

been equally divided, each would have received \$24.66 $\frac{2}{3}$. No action of the legislature or of your Board, could have aided the fishermen in obtaining better results. All that could be done was done for their benefit. The fish were not here, and therefore could not be caught. Fortunately, none of the fishermen are dependent upon the use of their seines for a living.

It will be seen, by reference to my report of last year, that the real value of the fisheries of the lower part of the Merrimac is dependent upon the menhaden. Whenever these fish are plenty in the river, the fishermen are amply rewarded for their labor; at other times the fishing is more a matter of diversion than of profit. The order permitting the taking of a considerable number of what are here called sea shad, was promptly carried out. Of the twenty-five hundred inspected by your Board, only one contained spawn. There was none in the catch which I afterward examined. All these fish were the true shad, belonging, if not to the Merrimac, to some other river. If there was any doubt as to their location, the benefit of the doubt was given the fishermen, in your decision granting them the privilege of taking these fish.

I also, under your direction, gave permission to take sperling at the extreme mouth of the river, on condition that no other fish were destroyed. The shad, which appeared early in the season, lasted about one week, then began to fall off, and in a few days entirely disappeared. Then the bluebacks struck into the river and lasted about a month.

I am happy to say that the good feeling on the part of the fishermen, which grew out of the meeting at my house, last June, where everything pertaining to the fisheries of the Merrimac, was freely and frankly discussed, still continues. No one complains that he has been injured by the passage of the law restricting them to the use of the 2 $\frac{1}{4}$ -inch mesh, and the better understanding of both sides of the question has, in my opinion, led them to honestly endeavor to keep their part of the obligation.

Yours truly,

EDWIN F. HUNT.

LOBSTERS.

The legislature, at its last session, passed an amendment to the lobster law, placing the enforcement of it in the hands of the Commissioners on Inland Fisheries. At the hearing before the committee on fisheries, which led to the passage of this act, all the dealers and lobster fishermen who were present were very earnest that the law should be enforced. There is no

reason to believe that they have not acted in good faith, but there is always a lawless element that requires looking after, and several arrests and convictions were made during the past season. So far as the cities and larger towns are concerned, the law has been fairly maintained. There is, however, a defect in the law, which, if not corrected, will make it of little value. Large numbers of small lobsters were caught during the year, put into locked cars, smuggled aboard vessels, and sent to New York, where there is no law regulating the size. Many were also sold at the hotels at watering places, or used for bait. Although fully satisfied of the fact, the officers had no authority to open the cars, and consequently no evidence that would convict. This has led to a good deal of complaint on the part of the law-abiding fishermen, who claim that nothing has been gained by the attempt to arrest this wholesale destruction of young lobsters. The feeling among many of the dealers and fishermen is that nothing short of a closed season, in which no lobster pots are permitted to be used, will be effective. If the lobster fisheries are to be preserved, — are to be saved from annihilation, there is a plain, simple way of doing it; one that requires no great amount of scientific knowledge, only a little exercise of common sense. You cannot have eggs, if you destroy your hens; you cannot raise chickens, if you do not save and protect the eggs. The lobster is a bay or estuary animal; it does not migrate like the cod, haddock and mackerel. Its range is so limited that it can be and has been so reduced in size and numbers as to be of little value in this and adjoining States.

The 10½-inch law, if rigidly enforced, would be a step in the right direction. It is profitable neither to the dealer nor the consumer, that the lobster should be marketed below this size. Again, lobsters less than 10½ inches, are seldom found with spawn; therefore, supplement this act with the right of search, and a close season of two or three months, covering the principal part of the spawning season, or that period when the most spawn is deposited, and you conserve not only the interest of the State but of the fishermen also.

OFFICE OF THE CHIEF OF THE DISTRICT POLICE,
65 BOWDOIN STREET, BOSTON, MASS.,
December 1, 1884.

E. A. BRACKETT, Esq., *Chairman Commissioners on Inland Fisheries.*

DEAR SIR: — In answer to your inquiry as to the enforcement of the statute, chapter 212, Acts of 1884, “An Act for the Better Protection of Lobsters,” I have the honor to inform you that from the reports of the officers of this force, I am of the opinion that the law is, in a great degree, inoperative.

It is alleged by many honest dealers, that large numbers of short lobsters are taken in every catch, and that it is of rare occurrence that they are returned to the water. These short lobsters, with others, are placed in floating cars, and moored some distance from the shore. Sales are made direct from said cars, and evidence of violations of the law cannot be obtained. Open sales of short or mutilated lobsters are seldom reported, and but ten prosecutions have been made since the enactment of the statute. To make the law more effective, the right of search, and authority to enter places and buildings where lobsters are kept, should be given to officers, whenever there is reasonable grounds to believe that the provisions of the law are violated.

Very respectfully,

RUFUS R. WADE,
Chief District Police.

EXTRACTS FROM REPORT OF W. H. VENNING, ESQ., INSPECTOR OF FISHERIES FOR THE PROVINCE OF NEW BRUNSWICK, FOR THE YEAR 1883.

Lobsters.

The effects of the enormous annual drain made on this shell-fish for the last fifteen years, are now plainly to be seen, and even interested cupidity can no longer deny them. Though the number of factories has increased and greater numbers of men have been employed, the returns show a decrease of nearly 2,000,000 cans, compared with the quantity put up last year. This serious decline in numbers, added to the still more serious decline in size, visible everywhere, points to the certain extinction of the fish, if the business continues to be pursued on the same excessive scale. In former reports, both annual and special, I have expressed my conviction that no creature can long withstand so great a yearly drain as has been made on the lobster. This drain has been out of all

proportion to the power of so slow-growing a creature to multiply. Even the cannery themselves are now convinced of this fact; but in the hope that the fish will last their time, they are redoubling their exertions to increase their catch; are endeavoring to make increased numbers of small fish compensate for the almost total absence of large ones, and are striving to have the present insufficient restrictions relaxed. While every officer in the Province, in whose district this fishery is pursued, records the fact of its failing supply, none of them, except Overseers Wyse of Chatham, Girouard of Buctouche, and Deacon of Shediac, offer any suggestions for its improvement or conservation. I have given their opinions in their own words in the abstracts from their reports. Whatever opinion I may entertain of the practicability of Overseer Wyse's views, it cannot be denied that their adoption would give lessees a direct interest in so conducting their business that their breeding stock could not be exhausted, and that none but mature and healthy fish should be killed. At present, neither cannery nor fishermen have any interest in protecting or conserving the fishery; their interest now lies rather in destroying it by over-fishing. But with respect to the opinions of Messrs. Deacon and Girouard, my own observation forces me to differ from their conclusions. The present close time extends from 20th August to 20th April, a period of eight months. Soft-shelled lobsters, those with eggs attached, and all less than nine inches in length, are now forbidden to be killed. With all this protection, the fishery shows indisputable signs of exhaustion. Not only is the supply failing, but the average size has fallen below nine inches. Had the law been rigidly enforced this season, every cannery in the Province would have been closed. In the face of these undeniable facts, I cannot see how *extending the fishing season* is going to improve matters, — increase the supply of fish or raise their average size. My conviction is now what it has been for years, that the fishery has been pursued to so unreasonable an extent that it is sheer folly to suppose it can continue much longer on the same extravagant scale. Mere tinkering with it will do no good. This has been tried and has failed most signally. Some radical change must now be made, or the fishery is doomed to extinction.

EXTRACT FROM ANNUAL REPORT ON THE FISHERIES OF NOVA SCOTIA FOR THE YEAR 1883, BY W. H. ROGERS, ESQ., INSPECTOR.

There have been several thousand tons shipped alive from Yarmouth and Shelburne to the United States during the past two or three years, — a profitable trade, likely to increase in the future.

The lobster is one of the most important items in our fisheries, and will become more and more so. Hence, every means should be adopted not only to facilitate the business but to protect the "raw material" from exhaustion. To this end, a rigid enforcement of an ample close season is indispensable, together with the protection of the female and small lobster.

The difficulty in regard to the closed season in the Provinces is that it does not appear to cover the best part of the spawning season.

In Scotland there is a closed season from June 1 till September 1, under a penalty of £5 for each lobster caught during that time.

In Norway and Sweden the close time is from July 15 to October 15. From the following report on the lobster fisheries of Norway, it will be seen that for a few years after the passage of the act making a closed season there was a falling off of the catch, but in the end the fishermen were greatly benefited. With a closed season of three months they were able to take a great many more lobsters than when they were allowed to fish the whole year.

EXTRACT FROM THE REPORT OF THE UNITED STATES FISH COMMISSIONER ON THE "NORWEGIAN LOBSTER FISHERY AND ITS HISTORY, BY AXEL BOECK."

By this law, which forbids all fishing during two and a half months, the yield of the fisheries was of course somewhat diminished during the first years following its passage, till the protected young could reach the necessary size. Thus fewer were exported in 1849 and 1850 than during the preceding years, so that, while from 1846 to 1848 about 600,000 were exported, the number had sunk to 408,310 in 1849 and 427,600 in 1850. This decrease, however, is not merely owing to the circumstance that the number which were usually caught during the close months remained in the sea, but likewise to the fact that the English joint-stock company which carried on the exportation from the districts of Jarlsberg and Laurvig began to pay a lower price for the lobsters, so that the fishermen resolved no longer to catch any, even during those months when they were permitted to do so. While from this district there were from 1846 to 1848 on an average about 26,000 exported every year, only 7,960 were exported in 1849, 1,664, in 1850, and none at all during the following years; but, in 1855,

14,470 were again exported, chiefly to Copenhagen. Since 1850 the lobster trade has steadily increased, and the governors, in their quinquennial reports on the economical condition of their respective districts, state that protection seems to have produced this result.

In the district of Stavanger, the exports rose, from 1850, when they amounted to 120,653, to 204,803 in 1854. In the South Bergen district it is also stated that the fisheries have increased. Of the following years, the least productive was 1858, when the exports from the whole kingdom only amounted to 553,238, on account of unfavorable weather during the whole fishing season; but, in 1860, the number had again risen to 1,333,037, and kept tolerably steady during the following years, so that the exports during these years were about the same as during the years 1825-30, when they were at their highest, only to decrease very rapidly during the following years. In 1860 the exports rose to 1,000,000, and increased constantly, till in 1865 they very nearly reached 2,000,000; viz., 1,956,276.

RETURNS OF WEIRS, SEINES, AND GILLNETS.

Returns have been received from 205 fisheries, comprising 93 pounds and weirs, 22 sea seines, 63 gillnets, 2 Connecticut River seines, 2 Merrimac River seines, 10 Taunton River seines, and 13 other fresh-water seines. In all, there are 34 less than last year,* of which 25 are gillnet fisheries. Each year fewer returns are received, so that we must infer either that the State is losing her fishermen, or that there is a decided neglect on their part to send in their returns.

There is an increase in the catch of sea-herring, flounders and flat-fish, eels, striped bass, and bluefish; but in the catch of most fish, as might be anticipated from the smaller number of returns, there is a falling off, as compared with the two preceding years.

Shad shows an increase of 2,539 over the catch of 1883. This increase is due entirely to the exceptional catch by the Newburyport sea seines. In the rivers there is a falling off in the number of shad caught. An Agawam fisherman, who caught only 54 shad, complains of the obstructions lower down in the Connecticut River, which prevent the ascent of the fish; but a South Hadley firm above him return 1,539 shad.

* Three more returns have come in since this report went to press.

A large decrease in mackerel and menhaden is noticeable.

A Mashpee fisherman records his observations that the herring, though plentiful, are only half grown this year.

SALMON AND TROUT.

The importance of specific knowledge of the salmon and trout of the country, in connection with the many questions that arise in relation to the determination of the several species and varieties in the New England States, have led the Commissioners to request Mr. Samuel Garman to prepare a paper on the subject for publication in this report. Mr. Garman is an assistant in the Museum of Comparative Zoölogy, and has charge of the collection of fishes belonging to the museum, and thus has been able, in his studies, to use the large amount of material in the museum. He has been aided also by specimens sent him by the Commissioners of New Hampshire, and from the hatching houses at Plymouth. His paper is given in the appendix of this report, under the title of Notes and Descriptions of the Salmon and Trout of North America, with notices of the introduced species. The illustrations accompanying the paper were made under his personal supervision by Mr. Denton, and are considered to be accurate delineations of the several species and varieties native to or introduced into New England waters.

LEASED PONDS.

Less than one-half of the returns of the leased ponds have been received. Taken as a whole, they show a large increase over former years. There are a few complaints that the fish have not increased. This may be due, in part, to the unfavorable character of the water, but mainly to a lack of management. Of the 114 leased ponds, seven give a total return of 237,817 fish caught during the past season. Computing returns received, and estimating others on the basis of former returns, the total catch from the leased ponds for 1884 would be about 400,000 fish. As the weight is not generally given, it is not easy to estimate the marketable value.

The inland fisheries, during the last ten years, have not only held their own against the demands of a growing population, but have steadily increased. What they would have been, had there been no effort to arrest their downward tendency, can be easily seen by any one who will give the subject a careful consideration.

E. A. BRACKETT.

F. W. PUTNAM.

EDWARD H. LATHROP.

EXPENSES OF COMMISSION.

Salary,	\$1,650 00	
Travelling expenses,	202 63	
	<hr/>	\$1,852 63

GENERAL EXPENSES.

Postage, telegrams, and expressage,	94 25
Printing,	64 70
Hardware,	12 72
Fish food,	31 37
Trout spawn,	100 00
E. B. Hodge, services as Supt. joint hatchery,	300 00
Assistant, services as Supt. joint hatchery,	67 50
Rent, joint hatchery,	50 00
Legal services, Fred. Williams,	28 00
Serving notices, deputy sheriff,	10 12
Rent of land for hatching house,	50 00
Subscription to fund of Penobscot salmon breeding establishment for 1884 and 1885,	400 00
Subscription to fund of Schoodic salmon breeding establishment,	400 00
E. F. Hunt, services and expenses,	457 25
B. P. Chadwick, services and expenses at North Andover shad hatchery,	64 11
E. S. Robinson, services and expenses at North Andover shad hatchery,	21 00
John L. Murphy, services and expenses at North Andover shad hatchery,	21 00
Robert Elliot, services and expenses at North Andover shad hatchery,	42 00
Patrick Barrett, services and expenses at North Andover shad hatchery,	15 00
J. C. Walker, services and expenses at State hatchery,	20 00
Expense planting salmon,	10 00
D. L. Withington, legal services and expenses,	22 79
Thomas S. Holmes, labor at Lawrence fishway,	70 00
Total,	<hr/> \$4,203 99

APPENDIX.

[A.]

LIST OF FISH COMMISSIONERS.

DOMINION OF CANADA.

[We have had no notice of any appointment to the office vacated by Mr.
W. F. Whitcher.]

PROVINCE OF NEW BRUNSWICK.

W. H. Venning, Inspector of Fisheries, . . . St. John.

PROVINCE OF NOVA SCOTIA.

W. H. Rogers, Inspector, . . . Amherst.

PROVINCE OF PRINCE EDWARD ISLAND.

J. H. Duvar, Inspector, . . . Alberton.

PROVINCE OF BRITISH COLUMBIA.

A. C. Anderson, . . . Victoria.

THE UNITED STATES.

Prof. Spencer F. Baird, . . . Washington, D. C.

ALABAMA.

Col. D. R. Hundley, . . . Mooresville.

Hon. C. S. G. Doster, . . . Prattville.

ARIZONA.

Hon. J. J. Gosper, . . . Prescott.

Hon. Richard Rule, . . . Tombstone.

J. H. Tagart, Business Manager, . . . Yuma.

ARKANSAS.

James H. Hornibrook, . . . Little Rock.

H. H. Rottaken, . . . Little Rock.

CALIFORNIA.

J. D. Redding, . . . San Francisco.

A. B. Dibble, . . . Grass Valley.

B. H. Buckingham, . . . Washington.

COLORADO.

Wilson E. Sisty, Idaho Springs.

CONNECTICUT.

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[B.]

ADDRESS

OF

HON. THEODORE LYMAN,

PRESIDENT OF THE AMERICAN FISH CULTURAL ASSOCIATION,

AT THE THIRTEENTH ANNUAL MEETING, HELD IN THE NATIONAL
MUSEUM, WASHINGTON, D. C., MAY 13TH, 1884.

Old Rondelet wrote a great work at the beginning of the sixteenth century on sea-fishes. His breadth of view included under the term "Fishes" almost every living thing that he found in salt water. It is in relation not to a fish, but to the radiated Medusa-head, that he uses these fine words, more familiar, perhaps, to our older naturalists than to those of the rising generation: *Immensa et summe admirabilis dei potentia atque solertia in rebus cœlestibus iisque quæ in aere et terra fiunt, maxime vero in mari, in quo tam variæ et stupendæ rerum formæ conspiciuntur ut quærendi et contemplandi nullus usquam futurus sit finis.* — "Vast and highly admirable are the power and skill of God in things heavenly and earthly, and in those of the air, but more especially in the sea, where are beheld shapes so various and stupendous that the study and contemplation of them shall never end."

He spoke thus in a spirit of prophecy. Three centuries have passed and we are still contemplating and investigating the things of the sea. We have skimmed its surface with muslin nets in search of its infusoria, and we have let down dredges and scraped its valleys three miles deep, and still the shapes various and stupendous continue to multiply. The more workers there are the more work remains to be done. Humble clams, worms and urchins take on great importance and become marine Sphinxes, asking riddles that no one can answer. Creatures that once were conveniently dismissed as gelatinous, or gristly, now advance claims to an intricate circulatory system, to muscular fibres and to nervous ganglia. Nay, they proudly look down on the vertebrates, in the matter of reproduction, as they pass gracefully through the varied stages of alternate generation and self-division.

Rondelet lived near a sea whose inhabitants were well calculated to excite his wonder and delight. He was professor of medicine at Montpellier, not many miles from Aigues-Mortes, the port whence St. Louis embarked for his crusade, and whose walls, now surrounded by dry land, were in the middle of the sixteenth century still bathed by the waters of the Mediterranean. The shallows of the bay teemed with the smaller crustacea and shells, while the open sea beyond was then, as now, the home of many fishes, varied in form and brilliant in color, — the whiting, the red mullet, and the tunny, celebrated by classic writers. There, too, were found the darting squids and the great-eyed octopus, while from its depths came the rosy coral.

In the ancient medical school of Montpellier still hangs the portrait of Rondelet in his red gown. He has the grave and placid look of a man who was master of his studies, and who stood well with science and with the Church. For had he not, as a patron, Bishop Pelicier? and was he not the first authority in zoölogy and medicine, at a time when a good scholar could acquire all that was known of these and many things beside?

Every gain in knowledge has a loss that balances it. As the current of human thought grows wider, it becomes also more shallow, and splits into that infinitude of little channels which now are called specialties. In each of these channels may be seen a diligent investigator urging forward his little skiff, and well content to be navigating what to him seems the great river of truth.

Learning has grown so great in our day that the genius of one man can grasp no more than a part of it; so that in proportion as learning becomes larger, generalization, which is the final end of learning, grows more difficult. Worse than this, the mind employed on particular investigations gets unsymmetrical. The side that is used is strengthened; the disused side fails, and there results a scholar who believes in one set of ideas only.

After all, then, we must look with a certain envy at the state of mind of old Rondelet. Like most men of his age, he had that richness of thought and expression which comes of many-sided culture, and a strong faith in things both material and immaterial. When he said "*Dei potentia*," he distinctly meant power of God, and not "*potentialities*" or "*molecular environment*" or "*power that works for righteousness*," or any of those modern euphuisms which taste in the mouth like weak boiled arrow-root. Nevertheless, if we look closely, we can find the beginnings of that skepticism which plays so great a part in our day. For both he and his Bishop Pelicier were strongly suspected of favoring the Reformation. As to his colleague, Rabelais, he was noted for his unortho-

dox opinions, and went so far as to describe the future life as a "great perhaps."

But it is high time to leave Rondelet, and turn our attention to his sea-fishes. Their importance was great then; it is greater now. We might know by analogy, did we not know by actual research, that fishes have ever been of the first importance for man's food. Their natural abundance and the easy capture of shallow species put them within the reach of the primitive savage. The skeleton of the pre-historic chief, found in the cave of Mentone, had as a head ornament a net strung with *Trochus* shells, showing that he had walked the beaches of the neighboring Mediterranean, whose waters doubtless furnished his food.

The shell heaps of Scandinavia and of America contain abundant bones of fish. Morton, of Merry Mount (1628), gives us a good idea how these shell heaps were formed, when he tells how the Indians came each year to the shore near Quincy, in Massachusetts, and there camped for a long time, feasting on the plentiful clams and lobsters, and alewives and striped bass, whose shells and bones combined with the camp offal to build those deposits that we call shell heaps.

In New England, it must have been the fish that furnished the surest support to the native savages. Even in the depths of its Arctic winter there was a chance to get eels, smelts and clams, and at the first approach of mild weather the waters teemed with abundance. "It (Pawtucket Falls) is excellently accommodated with a fishing place," wrote good Mr. Gookin in 1674, "and there is taken a variety of fish in their seasons, such as salmon, shad, lamprey eels, sturgeon, bass, and divers others. And this place being an ancient and capital seat of the Indians, they came to fish; and this good man (Mr. Eliot) takes this opportunity to spread the net of the Gospel to fish for their souls."

That child of Belial, Morton, of Merry Mount, as keen a sportsman as any of our Bohemian backwoodsmen, gives enthusiastic accounts of the abundance and excellence of the fish which were in the sea convenient to his house. He is the first author that mentions cod-liver oil, which now plays so beneficent though nauseous a part in medicine.

He writes: "The coast aboundeth with such multitude of codd that the inhabitants of New England doe dunge their grounds with codd, and it is a commodity better than the golden mines of the Spanish Indes. . . . Greate store of train oyle is mayd of the livers of the codd, and is a commodity that without question will enrich the inhabitants of New England quickly."

Almost coincident with the establishment of Plymouth Colony, we find laws concerning the fisheries, proof positive of the esteem in which they were held.

In 1633 was passed what I take to be the first law for the encouragement of fish-culture, in these words: "It is enacted by the Court . . . but if any man desire to improve a place and stocke it with fish of any kind for his private use, it shal bee lawfull for the Court to make any such graunt and forbid all others to make use of it."

In 1637 the same court enacted, with the contrary-mindedness of our Puritan forefathers, that six score and twelve fishes shall be accounted to the hundred of all sorts of fishes.

In 1670 it was set forth with pious teleology that "the providence of God hath made Cape Cod commodious for us, for fishing with seines"; implying that it might not be commodious for less religious persons. The act goes on to say that "careless persons" must not interfere with the said providence, "by leaving the garbage of fish to lie there."

The country had not been settled a half century before there was complaint of the diminution of fish. The act just quoted goes on to speak of the great inconvenience of taking mackerel at unseasonable times, whereby their increase is greatly diminished, and a law was passed prohibiting the catching of fish before they have "spauMED." This shows that our ancestors were not more logical than most of their descendants, who still hold, that to take a fish when ripe for spawning is in some peculiar way destructive to the species. It is almost needless to say that fishes taken at any time of the year are killed before they have "spauMED." The only reason that it is more destructive to take fish during the spawning season is because they are then tamer and are crowded together, so that greater numbers are likely to be captured.

The river fisheries, too, call aloud for protection. In 1709, it was enacted "That no weirs, hedges, fish garths, stakes, kiddles or other disturbance or encumbrance shall be set, erected or made on or across any river, to the stopping, obstructing or straightening of the natural or usual course and passage of fish in their seasons . . . without allowance first had, and obtained from the General Sessions of the Peace in the same county." This law especially applied to such fishes as run up the rivers to spawn, — salmon, shad and alewives. The Indians, in their day, were wont to construct weirs and the like obstructions to capture these fishes. But the Indians were few and were idle and wandering. They took only what was necessary for their present use. Now, however, had come the white men, who put up permanent abodes and in-

creased in numbers, year by year. They were money-makers, who worked every day and all the day. They would catch fish, not for themselves only, but to sell to strangers; and so they have gone on ever since. Pawtucket Falls, on the Merrimac, where the Apostle Eliot spread his net of the gospel, now furnishes the water power for the great manufacturing city of Lowell. And Merry Mount, to-day the country seat of John Quincy Adams, is a suburb of the metropolis of New England. The inhabitants no longer "dunge their grounds with codd," but are fain to buy that fish in the market at a round price per pound.

The river fish whose protection has cost most law-making in the old commonwealth of Massachusetts is the humble alewife. In contradiction of the proverb, "mute as a fish," this one may truly be said to have made a great deal of noise in the world. Like some men they are small and humble, but persistent and numerous. In the springtime the alewives stand in from the sea, and push up the smaller fresh-water streams, seeking ponds wherein to deposit their spawn. They come in great armies and insist on entering those ponds. Nothing less than a vertical wall six feet high will stop them. Amid the clatter of mill wheels, and in the very face of the sweeping scoop net, they force themselves through rapids, over falls, and by long underground drains, regardless of their perishing comrades, who by thousands fall a prey to the fishermen and to hawks and eagles, or who run themselves ashore in their frantic efforts to get on. It may be that only a few reach the spawning ground, and these are enough to keep up the race; for one female will lay a quarter of a million of spawn. They are, therefore, *par excellence* domestic and cultivable fish, and have been so regarded in Massachusetts for generations. As early as 1741, there was passed "An Act made to prevent the destruction of the fish called alewives," wherein it was provided that any owner of a dam "shall make a sufficient passageway, for the fish to pass up such river or stream, 'hrough or around such dam."

It is, however, not until 1790, that the alewife fishery of Taunton Great River first appears on the statute books, whose pages it was destined to encumber. If very few of my hearers know anything of Taunton Great River, the fact proves how miserably our system of popular education fails to instruct people concerning the most remarkable geographical features of the land. Taunton Great River was doubtless named in the spirit of contrary-mindedness already referred to as a characteristic in our Puritan ancestors. The unregenerate would be inclined to call it Taunton Small River, for it is a small stream, which heads in some ponds in the town of Lakeville, and after a short and quiet course empties into

the sea at Fall River. But not the mighty Mississippi itself bears on its bosom so great a mass of legislation. The great and general court of Massachusetts invariably spends a portion of each session in trying to regulate the fisheries of this stream. The fishermen of the upper waters always complain that those of the lower waters get all the alewives, while those of the lower waters maintain that their rivals feloniously conspire to shut the fish off from their spawning grounds. And when by some special providence, both sets of fishermen are at peace with one another, they invariably make a combined attack upon the regulations of the State Fish Commissioners. The riparian inhabitants of other alewife streams, although not so combative, are quite as much interested as those of Taunton Great River. Indeed it was in such waters that a sort of fish-culture first grew up. In some cases where a dam owner wished to save his water power by shutting up his fishway, he would agree to catch each year so many thousand alewives at the foot of the dam, and to convey them alive to the mill pond above, and thus to keep up the crop. And it has been the custom for more than a century to regulate these little streams by special acts which govern the public sale of the fish, the days on which they may be netted, and the fishways that are to be kept open for their passage. The law goes often so far into detail as to provide that each widow of the town shall have a barrelful for nothing. I have dwelt thus long on this humble fish, because its successful culture gives encouragement to attempt that of others more difficult.

I shall follow briefly the decline of the fisheries in New England, because it is there that an organized system of fish-culture first in this country took its origin. That region has two rivers of considerable size — the Connecticut and the Merrimac. Both rise in the cold streams of the White Mountains. The Connecticut, flowing south, empties into Long Island Sound, and the Merrimac, by a southeasterly course, reaches the Atlantic Ocean. A century ago both rivers abounded in shad, salmon and alewives, and would doubtless have continued for many years to give a fair yield in spite of over-fishing, had it not been for the erection of impassable dams, which were intended to give water-power to the manufacturers, or to furnish slack-water navigation to lumber rafts. As early as 1798, the Connecticut River was thus barred at a point just within the northern limit of Massachusetts, but it was not until 1847 that the Merrimac was in a like manner shut off by the great dam at Lawrence. In both cases the salmon, stopped on their passage to the spawning grounds, became extinct after a few years, while the shad and alewives, which could be bred in the lower waters, continued annually to revisit these rivers.

What happened on the Merrimac and Connecticut happened equally on almost every lesser stream in that region. The people of New England, lacking advantages for farming, turned all their attention to manufacturing. Water-power was then much cheaper than steam, so that before long there rose a dam wherever there was a fall great enough to turn a mill-wheel. Except some simple trenches for the passage of alewives, no fishways were then known. The complete ignorance of this subject may be illustrated by the great dam twenty-seven feet high at Lawrence. The charter of the company permitted the building of a dam, provided a pass were furnished for salmon, which should be satisfactory to the county commissioners. Before the dam was finished, a solemn council of the best ichthyological and engineering talent was held to determine what kind of a pass would be suitable. The council based its judgment apparently on the cheap wood-cut in the primary geographies of half a century ago, which represented a salmon briskly leaping over falls at least fifty feet high. At any rate, the salmon pass finally approved by the learned commissioners consisted of a simple plank trough, sloping from the crest to the foot of the dam, at an angle somewhat steeper than forty-five degrees. It is needless to say that the salmon declined to exhibit any of the feats of agility portrayed in the wood-cut of the primary geography.

There soon came to be a general feeling, and one under the circumstances quite natural, that manufacturers and fish mutually excluded each other, and so things were allowed to drift at their pleasure. The streams that emptied into salt water no longer furnished such abundant swarms of small fry as had in former days served to toll the sea fishes toward the land, while the passage of boats and steamers and the increase of population and of fishing tended to destroy or to scare away the fish of the small bays and coves. The balance of nature had thus been changed, and one part had reacted against another.

The steady diminution would have gone uninterruptedly on but for the revival of fish-culture.

The discovery of artificial impregnation of eggs is such a simple one that the only wonder is that it was not practised long ago. Country boys who watch the brooks in autumn know how trout deposit their eggs; and fishermen after hauling their seine ashore are familiar with the spectacle of spawn and milt flowing from the ripe fishes. It is more than likely that many persons have in the past times practised the artificial fecundation of ova. The process was described in 1420 by Dom Pinchon, a monk of the abbey of Réome. It was re-discovered by Jacobi, of Westphalia, in 1763, and several naturalists availed themselves of this method in their

embryological researches. Among others, Louis Agassiz, who, in 1838, hatched the impregnated eggs of Swiss white fish by tying them in a muslin bag, and sinking it on the margin of the lake of Neufchatel.

In 1843, two fishermen of the Vosges, Joseph Rémy and Antoine Géhin, not only hatched a large number of trout, but devised means of feeding them artificially. They succeeded in stocking several water courses in their neighborhood with these trout fry. Seven years later their results had become known to the scientific men in Paris. Napoleon the Third had already begun his elaborate measures for the material aggrandizement of France, and he took up fish-culture and the acclimatization of new animals among other schemes. He disliked the professors of the Garden of Plants, because of their Orleanist sentiments, and he set up a rival under the name of the Garden of Acclimatization, of which fish-culture was in some sort a branch. Its apostle was Professor Coste. With large appropriations from the central government he established at Huningue, near the Swiss frontier, a large and elaborate station for fish-culture. His enthusiasm was great. He estimated that the yield of fresh-water fishes in France was not worth more than \$1,200,000 annually, which he was confident could be raised by artificial fecundation to \$180,000,000. Like many another inventor, Professor Coste was doomed to opposition and disappointment. M. Rimbaud, Secretary of the Fishery Board of Marseilles, ridiculed what he called the unnatural water-culture. He said the machinery and labor for hatching and the artificial food would cost more than the fish would come to. He was not far from right. With plenty of money to work with, it was not difficult to build hatcheries, dig ponds, set up apparatus, and put in turbine wheels for pumping. The working of the establishment was more difficult. The spawn, collected at distant points and sometimes in a careless way, often failed to hatch. The fry, carefully placed in suitable pools, disappeared in a way considered mysterious until it was discovered that several large pickerel had found their way into the pools. The eminent engineers of the *ponts et chaussées* contended in vain with the waters of the Rhine, which sometimes backed up and flooded the pools and tanks, and anon receded, leaving the turbine wheels high and dry. Years rolled on, and Professor Coste was still struggling to make fish plenty in France, when the Prussian armies crossed the Rhine and appropriated Huningue to the use of the German Empire.

All these disappointed hopes had not been quite in vain. Many valuable experiments had been tried and precious information pub-

lished, and, above all, it had been discovered that certain things could not be done. Meanwhile, knowledge of these discoveries had crossed the Atlantic, and in 1853, Dr. Theodatus Garlick hatched the artificially impregnated eggs of trout. Three years later commissioners appointed by Massachusetts published a valuable report on the general subject of fish-culture, and attempted unsuccessfully to hatch trout. In the same year an admirable report on fisheries was written by the eminent scholar, George P. Marsh, who had been appointed a commissioner by the State of New Hampshire.

The true beginning of fish-culture, however, under the auspices of State governments, was in July, 1864, when New Hampshire and Vermont passed legislative resolves calling on Massachusetts to re-establish a free passage for migratory sea fish through the dams on the Connecticut and Merrimac rivers. To the late Judge Henry A. Bellows, of New Hampshire, this country owes the successful beginning of the undertaking. He was an advocate learned in the law and full of enthusiasm for the restoration of the former runs of salmon and shad in the cool waters of the Pemigewasset and the broad expanse of Lake Winnepiseogee. He appeared before a committee of the Massachusetts legislature, and by their recommendation two commissioners were appointed, of whom I had the honor to be one. This was in 1865. Within a year every New England State was represented by fishery commissioners. They were accustomed to assemble from time to time for the discussion of their mutual interests. These modest gatherings, whereat the assembled authorities failed not to test the excellence of their own fish, were the prototypes of the national gathering which we celebrate this evening.

The opening of the great dams by fishways led to several important results. In the first place the decision in the case of the Massachusetts Commissioners against the Holyoke Water Power Company, has settled the law in regard to the rights of migratory fishes in rivers. This decision, which was confirmed by the United States Supreme Court in 1872, sets forth that a river was a public way, and the passage of migratory fish in it a public right. Therefore, whoever builds a dam across a river must furnish a passage to its migratory fish unless expressly exempted by the legislature.

It thus became easy to open the streams, and hundreds of owners of dams, who, by adverse possession had considered themselves safe from intrusion, now found themselves obliged to construct fishways at their own expense.

The second important step was also a legal one. It was the passage in 1869, by Massachusetts, of an act to encourage the cul-

tivation of useful fishes, which was intended to embody in one law all necessary regulations. Before that time the fishery laws of that State, to the number of nearly four hundred, were for the most part special enactments. The new statute substituted general provisions. It established a board of fishery commissioners, and gave them suitable power; gave to the riparian proprietor the control of ponds not exceeding twenty acres in extent, and regulated the times and methods of taking fish.

In attempting to restock the Merrimac and Connecticut, the most difficult problem possible was the one first encountered, that of building a fishway which would carry salmon, shad and alewives over a vertical dam near thirty feet high. In this country we had nothing to go by save the salmon passes of Great Britain, or the little water-steps over the low continental dams. Through successive improvements we have now attained a fishway that will with certainty carry salmon, alewives and the common river fishes over the most difficult dams. But the shad, with his love of the broad, gentle stream, and his suspicion of artificial contrivances, still remains rebellious. There is, however, a strong belief that the ingenious Colonel McDonald will irresistibly inveigle the shad into his mysterious pass. It is, indeed, a truly Irish pass, in which more water runs in than runs out; and the steeper is the incline, the more rapidly the water runs up hill; so that a shad would think he was swimming towards Fortress Monroe when he was in reality going over the falls of the Potomac. From the outset, the Massachusetts Commissioners had foreseen that the building of fishways on the Merrimac River was but a half remedy. It was further necessary to breed salmon and place them in the upper waters, that they might thence descend to the ocean, and return as marketable fish to their native river. To obtain impregnated eggs of salmon was at that time a work of great difficulty and expense. In the autumn of 1866, Dr. W. W. Fletcher, of New Hampshire, placed 15,000 New Brunswick salmon eggs in the Pemigewasset; but it was not until 1872, that 16,000 young fry were let loose in its waters; and in 1873, 185,000. Occasional captures of salmon in nets at various points on Massachusetts Bay were soon after reported; and on the 31st of May, 1877, two full-grown salmon were discovered mounting the Lawrence fishway. Since that year, salmon have been artificially bred at the head waters of the Merrimac, and the full-grown fish have annually ascended a river in which for twenty-five years they have become extinct.

The other chief river of New England, the Connecticut, was the scene of the first artificial hatching of the shad. With the encouragement of the Massachusetts commissioners, Seth Green of New

York, began, in the summer of 1867, his experiments in shad hatching at Holyoke. His simple and ingenious invention of a hatching box, which kept up a constant current by floating, not horizontally but at an angle, has become a matter of familiar history. Great was the ridicule directed against Green, as he painfully waded about in the river under the hot July sun. But when, a few seasons later, the shad appeared in unusual numbers at the mouth of the river, ridicule was changed to admiration, and the great crop of that year was called "Green's shad."

In the following year, 1868, shad hatching was established on the Merrimac, and daily record was kept of the temperature of the air and water, of the number and sex of the fish taken, and the quantity of eggs hatched. These tables were the first of the kind published in this country.

The progress of this slight sketch has brought us to the question which underlies the subject of fish-culture in its broadest sense; it is the question of the possible exhaustion of great fisheries, and especially those of the sea.

We have seen that soon after the settlement of the country complaints of the decrease of fish began to arise. It is very likely that these complaints came rather from the accidental differences of seasons than from any real decrease. Nevertheless, they indicate that the relation between overfishing and decrease of the crop was one that was early suggested to our people. The entire subject was brought into prominence in our own day by the report of the English commissioners to inquire into the sea fisheries of the United Kingdom in 1864. Of these commissioners it has been said: "Their industry was so extraordinary, and the piles of evidence were such as to leave the impression that every fish-wife in the three kingdoms had had her say. The trawlers were vehement against the set-hook men, and the set-hook men were furious against the trawlers. The commission decided that they all were right, and might fish when, how and where they pleased, But just then Mr. Bertram comes out with his 'Harvest of the Sea,' in which, by fact and figure, he aims to show just the opposite; namely, that the open-sea fish had decreased by overfishing."

The question of the progressive exhaustion of sea fisheries came up six years later in America, in the form of a monster petition presented to the Massachusetts legislature, which was asked to pass a law restricting fishing with weirs, seines and gillnets. The petitioners alleged that valuable fishes, such as the scup, the tautog and the striped bass, were taken by the above-mentioned contrivances in so wholesale a way as to threaten their speedy extinction. The complaints applied chiefly to the southern waters,

including those of Narragansett Bay, where the inhabitants of Rhode Island were equally interested, and both States proceeded to investigate the subject. Their methods, however, were no better than had been those of the English commissioners, and consisted chiefly in the examination of numerous witnesses. It was the same story over again. The weir men swore against the hook-and-line fishermen, and the hook-and-line fishermen swore against the weir men. The moment had evidently arrived to abandon the methods of the court-room, and to take up those of scientific investigation.

To this end the Massachusetts commissioners, in the spring of 1881, hired a weir at Waquoit, on the south side of Cape Cod, and put it in charge of an observer, who kept a daily record of the fishes taken, of the wind and weather, and of the temperature of air and water. At the end of the season the results were embodied in a report entitled, "Third Notice upon the Possible Exhaustion of Sea Fisheries." It was shown by this investigation that the moment at which fishes leave the ocean to enter rivers is determined by the temperature of the water. It further appeared that these so called anadromous fishes are usually caught in weirs and in similar traps, when hurrying along the coast in their northward migrations, whereas those that arrive near or at the mouth of their native river, slacken their pace and cautiously feel their way, like a ship standing into a harbor. These last are more apt to avoid the nets ingeniously set for their capture.

Up to this time the movement in favor of fish-culture had been confined to New York and New England, and chiefly to the State of Massachusetts. Dams, hitherto impassable, had been opened to the passage of anadromous fishes; fish-ways of an improved form had been built; a decision of the Supreme Court had given to fish the right of way in rivers; acts for the encouragement of the cultivation of useful fishes had been passed; the artificial hatching of shad and salmon had begun, and an investigation into the exhaustion of sea fisheries had been set on foot. All these measures were, however, partial and on a small scale. The moment had arrived for the interposition of a power stronger and more general in its character.

That democratic and gregarious fish, the scup, was the founder of the United States Commission of Fish and Fisheries. It is a fish coeval with the first white settlements. In 1621, on the shores of Buzzard's Bay, the hungry Englishmen were entertained by Massasoit with "two fishes like bream, but twice as big and better meat"; and Roger Williams says, in 1642, "Mishcup, the bream. Of this fish there is an abundance, which the natives dry

in the sun and smoke, and some English begin to salt." With the first warm days of spring, the scup were wont to push into the bays and fiords and salt ponds in great multitudes, standing in from the off-shore depths which had sheltered them and furnished them abundant food during the winter. Then followed a jubilee for poor and rich. Anybody who had a hook and line could catch a "mess of fish" before breakfast; scup, he was sure to get, and he was likely to get a fat tautog or a striped bass. But when did a Yankee ever allow any peace either to himself or to his neighbor, or when did his mind, sleeping or waking, ever cease to dwell on the invention of some labor-saving machine? Hook and line was too primitive a method to be permitted in this age of improvement. About the year 1846, one Benjamin Tallman, being doubtless moved and abetted by the evil one, conceived the idea of driving posts in a straight line running out to sea, and stretching thereon netting so as to make a fence, and constructing at the end thereof a sort of enclosed yard. The schools of scup, as they coasted along the shore, ran against the fence, and turning their heads seaward, were captured in the said yard. The inventor, in the pride of his heart, named this engine a "trap." He little knew that he had only made a small copy of the contrivance that was known to the Phœnicians, who used it along the shores of the Mediterranean and even on the coast of Spain. There, in later days, the Moors called it the *almadraba*, whence is derived the modern French word *madrague*. If the Moors created as much popular indignation with their *almadrabas* as Benjamin did with his "traps," the fact may account for their expulsion from Spain by the Gothic tribes. For twenty years, war and recrimination prevailed between the trappers and the hook-and-line men, until, at length, both parties, like the Jewish factions, determined to appeal unto Cæsar, or as he is now called, Uncle Sam.

On the 19th of February, 1871, was passed a joint resolution of Congress, the preamble of which says: "*Whereas*, it is asserted that the most valuable food fishes of the coast and the lakes of the United States are rapidly diminishing in number, to the public injury, and so as materially to affect the interests of trade and commerce, *therefore*, *Resolved*, that the President be authorized to appoint a Commissioner of Fish and Fisheries."

It has been truly said that when the critical moment arrives, the man appears also; and this critical moment made no exception to the rule. A man — nay, *the* man — was at once found in the person of Professor Spencer F. Baird. The Cæsar to whom the warring factions had appealed could not have sent forth a more judicious prætor. Mercifully he was not one of those self-taught men

(of whom for some occult reason we are so proud), but a man of careful scientific training; and one as industrious in collecting facts as in arranging them. Also, was he a man of a pleasant countenance and conversation, and well calculated to assuage the irritated feelings of the hook-and-liner, or to soothe the exasperated nerves of the trapper. Indeed, he seems to be the only individual in history who ever intervened between two combatants without receiving the blows of both.

Henceforth the history of American fish-culture is contained in that of the United States Fish Commission. Its work, wide spread and pushed with extraordinary energy, attracted the attention of the whole country. A greater part of the States appointed fishery commissions, which co-operated with and were assisted by that of the general government. Its rapidly increasing value and power culminated in the great fishery exhibitions of Berlin and London, where the United States exhibits gained the chief prizes.

The history of the movement for the restoration of our fishes may seem like a triumphal march; but in summing up its results, we cannot in honesty avoid the cold question *cui bono?* of what good is all this?

Up to the year 1880, the fishery commissions of the States and of the general government had had appropriated \$1,306,378. Has the country got a return of a million dollars' worth of additional fish?

In 1880, the total value of the fishery products of the United States was \$43,000,000, a less sum than that of the manufactures in a single Congressional district in the little State of Massachusetts. The two products show that real value is not always to be measured by money. The people of this country could have been deprived of the manufactures of that district without recognizing their loss, but what an outcry would arise were they cut off, even for a month, from cod and white-fish, lobsters and oysters!

Did the expenditure of \$1,300,000, since 1866, add anything to the \$43,000,000 which our fisheries produced in 1880, or did it pave the way for an increase?

To answer these questions we must define what we mean by a decrease in fisheries.

When so many fish are annually taken from the waters that the remainder are not numerous enough to produce a new crop equal in numbers to the old one, there must be a progressive decrease in the yield. It is a very simple matter to demonstrate such a decrease in ordinary rivers or in lakes of moderate size, where it is easy to show that spearing and netting of the trout on their spawning beds has diminished their numbers, or that the establishment of weirs

has made white-fish scarce. In the bays and coves of the sea, also, where the waters are shallow, it is not difficult to show that the use of numerous fykes and trawl-lines destroy the local fish, like tautog, rock-bass and flounders. But, when we come to the schooling fishes of the open sea, it is very difficult to tell how much effect the hand of man has in lessening them. If, for example, we argue that traps and purse seines diminish the crop of menhaden by capturing them in enormous numbers, we leave out of mind the fact these same traps and purse seines also capture bluefish and small sharks, which are thus taken from their daily occupation of killing menhaden. Again, when menhaden entirely disappear from a long stretch of coast, they are, in reality, no scarcer than before. They refuse to come to their wonted waters, either because the temperature is too low, or because their favorite food is not to be found. They are not destroyed, only absent. There are familiar instances of such disappearances. The scup was plentiful when the whites first landed in New England; they afterwards disappeared, and reappeared about the beginning of the present century. The bluefish was caught on the southern coast of New England from 1659, for more than a hundred years. In 1764 they disappeared, and, after an absence of sixty-six years, they reappeared about 1830.

Another element that must be borne in mind in estimating the total catch of fish, is the number of men and the kind of engines employed. If, for example, the population of a coast is scanty, and only a dozen men go afishing, each of them is likely to have a good catch; but when the coast becomes thickly settled, a hundred men will fish, and though each one may take but few, the catch of the hundred will be much greater than that of the twelve.

In the light of the patient investigations of the past dozen years, it is safe to assert, first, that our fresh-water fisheries have, in general, greatly diminished since early times, and have, in some cases, been destroyed. Secondly, that the local coast fisheries have also to a greater or less degree diminished.

What have our fishery commissions done to remedy or to palliate these evils? It is fair to say that they have done a good deal, and are in a way to do more.

Their first, and perhaps most valuable service has been to excite universal interest in our fisheries, and to draw general attention to their importance. The second great step in advance has been the accumulation of a vast amount of accurate information concerning the numbers and variety of our fishes, their food, manner of breeding, condition of life, migrations and stages of growth. The third degree of progress has been fish-culture, which may be called negative and positive: negative, when obstructions to the increase of

fish, such as improper apparatus and impassable dams are removed ; positive, when fishes are artificially bred, or when new species are introduced from distant countries.

It may be fairly said that both forms of culture have already given considerable results. Of the success of negative culture, a familiar example is that of the smelt, which, a few years ago, had grown scanty in numbers and small in size on the Massachusetts coast, because the breeding fish were captured in the brooks when crowded together on their spawning beds. The prohibition of this kind of fishing was followed within three years by the restoration of the smelts to their former numbers and size.

The best instance of positive culture is that of the California salmon in the Sacramento River, where Livingston Stone, by annually turning into the river 2,000,000 young fry, artificially hatched, increased the yearly catch from 5,000,000 pounds to 9,500,000 pounds.

Wide experience in the hatching of shad and white-fish proves pretty clearly that a marked increase may be obtained, if the work be done on a scale large enough, and that an amount of work insufficient to produce a positive increase will, nevertheless, check the decrease of these species.

In a word, artificial breeding, by greatly augmenting the proportion of eggs impregnated and by protecting them until hatched, presents a great advantage over the natural process, and gives us an available method of preserving many important fisheries. But to produce results of commercial value, this water-culture must be practised as universally and methodically as is agriculture.

It is not the custom of Americans to stop half-way in a profitable enterprise. Therefore I do not doubt that in the next generation some of our chief fisheries will be maintained by an established system of artificial culture.

Perhaps, in that day, the honorable guild of fishmongers will erect a monument of their gratitude, and will inscribe on its tablets the names of scientific men who have, in our time, labored to create a new industry.

[C.]

FISHWAYS ON THE RIVER SIRE.

By A. LANDMARK, Government Inspector of Fisheries, Norway.

The salmon fishways at Sire have attracted considerable attention in the last few years, being the greatest undertaking of this description ever completed in the world. We accompany this article with an illustration of the larger and more complicated of the two fishways of which we are to speak — the one at the so-called Rukanfos, or upper Logsfos.

It is commonly believed that the main object of salmon fishways is to enable the greatest possible number of persons to share the profits of the salmon fisheries, by affording the owners, whose property is situated above the obstacles to be overcome by the fishway, an opportunity to participate in the salmon fishery. This belief, however, is far from being correct. If in building fishways this was the only object, it would not only be an unnecessary waste of time and money, but simply an injustice to the present owners of the salmon fisheries, as their legally attained rights, self-evidently, would suffer, when being compelled to share them with others. The true object in building salmon fishways is, much more, to increase the salmon by improving the conditions on which the reproduction of the fish is dependent. The salmon can only increase in rivers, where it can spawn late in the fall or early in the winter, in places where the river bottom is made up of fine gravel and where there is an even, somewhat swift, but not violent current. In many salmon rivers, places of this description are rare, especially near the mouth of the river, where the bottom usually consists of clay, mud, or fine sand, and the water is impure. When the salmon is confined to short stretches of river of this nature, it is forced to spawn in places, which, if not altogether injurious to the development of the fry, are, at all events, in great

measure unfavorable, and the inevitable result is that disproportionately great quantities of spawn are destroyed. And as every river is usually only frequented by the salmon hatched in it, the consequence is, that even great rivers will contain but a small number of salmon as long as desirable spawning grounds are so limited, or of unfavorable conditions. The spawn that is destroyed by such unfavorable circumstances, can easily be saved by fishways, as they enable the salmon to reach better and more extensive spawning grounds above the fall or dam that obstructed their further passage. Of course, it does not always hold good that a river contains better spawning places above the fall or dam than below; but as a rule, especially in the larger rivers, the conditions for hatching the spawn are better at some distance from the sea, both as to the quality of the river bottom and the purity of the water. It is self-evident that all these circumstances must be considered before building the fishway, and that any work of this kind is useless, unless some improvement of the natural conditions can be made. Good fishways, then, constructed in the proper places, will greatly improve the productiveness of a salmon river by augmenting the number of favorable spawning places.

The great results attained in this manner can be seen in other countries. In the Ballisodare river, on the northwestern coast of Ireland, where formerly no salmon was found, on account of an insurmountable waterfall at the very mouth of the river, they have succeeded, by using three fishways, in establishing a salmon fishery, valued at 50,000 kroner a year, considerably more than the value of salmon fishing in any Norwegian river. By far greater profits have been realized in other rivers of Great Britain and Ireland by building fishways and demolishing mill dams. But such splendid results can scarcely be looked for, except in countries where both the natural conditions of the land and the law in every instance furthers and protects the development of salmon fisheries.

Owing to the nature of our country, the falls in our rivers are so numerous, that places which can be reached by the salmon are very limited in extent. Although the area of England and Ireland is only about two-thirds of that of Norway, and the rivers of those countries are much more obstructed by dams, the total length of rivers in England and Ireland, favorable to the salmon, is about three and a half times as great as that of Norway, where the total length of salmon rivers is estimated by the Inspector of Fisheries to be 4,000 kilometers (2,485 miles). Hence there is a great field for fishways in our country, although many waterfalls are of such a nature that it is impossible to pass them. As yet

but little work of this kind has been done, and it is feared never will be done, as long as the state does not appropriate the sufficient funds.

Of all our fishways these of the Sire are the most extensive. Sire, situated between Lister, Mandals and Stavanger, is 146 kilometers (90 miles) in length. By nature it is accessible to the salmon only a few hundred meters above the brackish water, where we have the Logsfos, 8.5 meters (28 ft.) in height; 1,200 meters above there is another fall, Rukanfos, total height 27.2 meters (89 ft.). Both these falls can now be passed by fishways, whereby 70 or 80 kilometers more are made accessible to the salmon, and where several good spawning places are found, whereas formerly the naturally accessible were few and unfavorable. As a consequence the number of salmon in the river has always been small compared with its size. The fishways were designed jointly by the Inspector of Fisheries Landmark, and civil engineer G. Saetren, and executed during the summer and fall of 1880. The total cost has been 25,000 to 26,000 kroner. The fishway at Logsfos is of a very simple construction, consisting mainly of a 320 meter (1,050 ft.) long channel of considerable dimensions, dug on the eastern shore of the river. At the lower end, where the channel is conducted through a narrow ravine, traverses have been built to moderate the swiftness of the current. At both ends the channel is fitted out with special contrivances to secure its effectiveness and durability. In order to obtain a sufficient water supply at low water, without too extensive excavations, a dam has been thrown across the river just above the fall, whereby the water level is raised. As this dam is not quite completed, there is not water enough in the channel in very dry seasons. Much grander and more complicated is the fishway at the Rukanfos, represented in our engraving; it surpasses every work of its kind, both on account of the fall and the obstacles to be overcome. The total height of the fall is, as stated, no less than 27.2 meters (89 ft.), and the steep, wild cliffs that surround it on all sides, leave but little space for building a fishway. Further, the floods which occasionally occur are exceedingly violent, often causing the water to rise 6.6 meters (21.6 ft.) both at the foot and head of the fall. Extraordinary measures have been necessary in order to procure the necessary room to protect the works against the flood and make them useful at low water. The engraving gives a general view of the work, at the same time conveying an idea of the huge, very nearly perpendicular, mountain side that towers above the fall at its left. It will be seen how the lower part of the fishway is guarded by two immense stone

walls and, partly resting on one of them, winds up through the narrow ravine, until reaching a point from which it is continued in a more horizontal direction. The fishway, which is built of wood, except at the very top, where it is blasted into the stone, has a grade of 1 in 7 and 1 in 8, and is principally arranged according to an American system (E. A. Brackett's), with a few minor alterations. The other two engravings show its complicated arrangement, with the numberless current breakers which check the motion of the water in a very high degree, and at the same time making the ascent about three times as long for the salmon. The total length of this fishway is 285 meters (935 ft.), while the passage to be made by the salmon is 785 meters (about one-half mile); it is 2.82 meters in width, with a depth of 1.18 meters; depth of water about one meter. The punctuated cross-lines in the outline show the current breakers, fixed in the bottom of the channel to check the swiftness of the current. The greatest peculiarity about the fishway is the construction of the lowest part nearest to the mouth of the channel. To make the fishway more attractive to the salmon, a side channel, which lies nearly horizontally on top of the lower part of the way, has been constructed to increase the water; to keep the water from overflowing during a flood the walls are made considerably higher at the mouth, where they are no less than 4.2 meters high. The upper course has also some peculiarities of its own, consisting of a number of cross-dams, whose level is 0.4 meters lower than those opposite, and in each there is an opening at the bottom 0.89 meters square. The principal dam at the top is fitted out with a trap-door which can be opened and closed at pleasure. It has been seen that the salmon can now pass the fishway without any difficulty, notwithstanding that some improvements, to make the fishway more useful at very low water, still remain uncompleted. As the number of salmon in this river, owing to the lack of spawning places which are accessible to the salmon, was small when the fishways were constructed, some years must pass before the results of the labor can be seen. Only few salmon have so far passed up the fishway. When the remaining improvements have been completed, the undertaking will undoubtedly pay largely. At the upper part of the fishway a house for the artificial hatching of salmon has been constructed.

[D]

THE BLACK BASS.

From "American Field."

There is, perhaps, remarks the Philadelphia "Ledger," no other food fish indigenous to American waters so widely distributed as the black bass. Originally its habitat comprised the whole of the United States east of the Rocky Mountains and from Canada to New Mexico, with the exception of the New England States and the Atlantic seaboard of the Middle States. Now it is to be found in nearly all the fresh waters of the continent, having been introduced into those in which it did not originally abound by private individual enterprise, and by the combined agencies of the National Fishing Commission and of the Fishery Commissioners of the various States.

Being a remarkably hardy fish, easy of transportation, transplanting has been generally successful; and, being in addition very prolific, it has multiplied immensely wherever the fishery laws have been respected, and in a great many instances where the legal statutes for its protection at certain seasons have been set at defiance.

Pennsylvania has been conspicuous for the number and extent of these violations, notwithstanding the stringency of the laws and the strenuous efforts of the State Fishery Commissioners to have them respected. Had the close seasons been observed as they should since bass were first introduced in our State, its waters would to-day teem with these fine fish, and though no definite estimate as to the money value of such increase can be made, it is hazarding nothing to assert that it would be immensely large; for the black bass is aggressive, self-reliant, and abundantly able to care not for itself only but for its progeny also, and with every disposition to do so.

How rapidly they multiply can be learned from the facts connected with their introduction into the Potomac River. About the year 1854 thirty black bass taken from the Ohio River were placed in the canal basin at Cumberland, Md. Some of them, possibly all, escaped into the Potomac, and so remarkable has been their increase, that to-day, and for a number of years, the principal markets north have been supplied with bass from its waters. Notwithstanding these heavy drains upon its resources in that line, the bass do not appear to have diminished in numbers; on the contrary, the successively larger annual catches prove that they are growing more and more abundant, affording a comfortable livelihood to a great many professional fishermen, and rare sport to thousands of anglers.

The first successful attempt to introduce the black bass into Eastern waters was made in New England in 1850. This was followed by others, with equally encouraging results, until there is scarcely a lake, pond, river or creek east of the Alleghenies, that has not been stocked with them, and in which they are not constantly multiplying.

Pennsylvania was among the last of the Atlantic States to give the subject attention. It was not until 1869 that a private citizen placed some black bass in the Susquehanna at Harrisburg. These increased rapidly. At many points on that river they are now caught in fair numbers and frequently of large size.

In 1873 the State Fishery Commissioners, deeply impressed with the merits of the black bass as a food fish, and the special adaptation of the streams of the State to it, supplied thirty-five different points in the tributaries of the Potomac, Susquehanna and Delaware rivers. In nearly every instance—presumably in all—these plantings proved successful, as the bass delights most and thrives best, and perhaps only, in clear, pure water, avoiding that which is stagnant or sluggish. Whenever, therefore, even moderately fair opportunities have been afforded them, they have well repaid the trouble and cost of their transplanting. Were it possible to secure for them entire immunity from interference by net fishermen, anglers, dynamiters and others bent upon their destruction, for five years only, the increment would be so great as to largely augment the present animal food supply. The people of the State, at least the many who have been most eager and most successful in taking them, in season and out of season, do not appear to have a proper appreciation of this fact; hence every device that could possibly be employed for their taking has been brought into requisition; and for this reason the increase in the waters of the State

— the natural advantages considered — has not been as great as in States where greater respect has been paid to the fishery laws.

The new Board of Fishery Commissioners has, it is understood, resolved to make special and much more vigorous efforts to secure a better enforcement of existing laws, and if possible to secure such additional legislation as may be needed to carry its intentions into full practical effect.

The habits of the black bass furnish very interesting subjects for study. These fish spawn from February until after midsummer, the time depending upon locality, the temperature of the water, etc. Leaving the deep water early in the spring, they resort to the shallower, where they pair off for breeding, generally selecting for their spawning beds gravelly or rocky bottom, and water from eighteen inches to three feet in depth, though at times water of greater depth is chosen. The eggs are usually deposited on the bottom in rows, and being fecundated by the male, stick to whatever substance may be found there. They are hatched in about a fortnight, sometimes less, the time depending upon the depth of the water and the temperature. The parent fishes maintain a vigilant watch over the spawn, driving off intruders. They keep the water in the vicinity of the eggs in constant motion, by a continuous gentle motion of their fins, in order to prevent impurities from settling upon them. After the eggs are hatched the vigilance of the parent fishes appears to be redoubled. The young emerge from the egg almost perfectly formed, and remain on the bed from three to six days, when they seek deeper water, or places where they can readily take refuge from the pursuit of enemies. The parental guardianship is maintained until the young fry are able to take care of themselves. They grow rapidly, attaining, when food is plentiful and of the right kind, the weight of a pound during the first year, the annual increase thereafter being about in the same proportion until the maximum, which is from five to six pounds, is reached, though heavier ones of the small-mouthed variety are claimed to have been caught. Large-mouthed bass of *Funda* have been taken weighing sixteen pounds.

There are few fresh-water fishes more palatable than the black bass. Its flesh possesses the desirable qualities of firmness, flakiness and whiteness, combined with solidity, proper juiciness and rich flavor. As a pan fish, it is fully equal to the well-known sea bass, and the larger ones are by many as greatly esteemed for boiling or baking as sheepshead. Taken as a whole, when properly served, it has few superiors, and if the salmon and brook trout are excepted, probably none. It is cosmopolitan, thriving equally well

North and South, demanding only pure water, plenty of it, and to be let alone during its spawning seasons.

Viewing the black bass from a sporting standpoint, it has everything to commend it to the favorable consideration of those who delight in what may be termed game angling, though there are a great many who hold in thorough contempt the idea that there can possibly be any true sport in angling for any other fish than the salmon or the speckled trout. It would hardly be fair, because of the great disparity in size, to compare the former with the black bass; but when the taking of trout is contrasted with bass fishing, only those who have not had experience with both will insist upon according a preference to the former. The respective merits of the two as game fish have been widely discussed of late years, with a decided leaning toward the bass, as their game qualities become more thoroughly understood. The trout is as full of pluck and decidedly more beautiful than the bass, and is withal a brave and honorable fish. It fights to the last gasp, and yields only when unable longer to resist. But trout of a respectable size are becoming rare and difficult to find. The relentless pursuit of them has nearly depleted the waters in which they once abounded, so that only those who can afford to take long and expensive trips are afforded opportunities for honest comparison. But, conceding to the trout all that is claimed for it, there is no disputing the fact that the black bass, though less comely in appearance, is fairly its equal in point of gaminess. It has been called "the hog of the waters," though it is not easy to appreciate the title, unless because of the voracious disposition of the bass. More powerful in the water than the trout, more democratic in its tastes, fully as stubborn in its resistance when impaled on the hook, and more dashing and vigorous in its struggles for freedom, the angler finds in it a combatant of bull-dog proclivities, and one whose rapid reproduction and constantly increasing plentifulness fully entitles it to the hearty welcome it is receiving on every side; not the least of its merits being the solidity, sweetness, juiciness and tenderness of its flesh when properly cooked.

The black bass is a voracious feeder. It is charged with being the Ishmael of the fresh waters, one of the most heinous of its alleged offences being that it wages unceasing war upon smaller fish of almost every variety.

The black bass, although not an indiscriminate feeder, is not at all capricious in its tastes. Impetuous and fierce in its assaults upon whatever has the appearance of provender, it is readily taken with artificial flies, the varieties of which are almost endless. Artificial lures of the most novel forms are also used. Prominent

among these Protean devices, and perhaps the best, is what is known as the spoon-bowl, with its single hook. Those who desire to know how large is the number and variety of these traps for black bass must visit the establishments where such tackle is sold and see for themselves.

Perhaps the most attractive natural bait for black bass is the live minnow. While experts at bass fishing insist upon the superiority of certain kinds of small fish for bait—the preference being given to those of the most silvery appearance—the tastes of the black bass are so nearly omnivorous in regard to minnows that it will readily take almost any that may be offered. Catfish from four to five inches in length, although not silvery in appearance, have been found a taking bait in almost any water. Just here it is proper to remark that the angler will find profit in the use of large minnows, as a bass of seven or eight inches will readily take in a minnow of four or five.

The helgramite, a repulsive looking creature, the larva of an insect of the neuropterous order, is a capital bait, as is the craw or cray fish. Both are found in nearly all our fresh waters. Young frogs are at times almost irresistible, as are grasshoppers and crickets. Young catfish, and, when they can be procured, “mud-dabblers,” a small fish plentiful in the vicinity of Baltimore, are in great request among the Susquehanna bass anglers.

At seasons when natural live bait is not easily procurable the common earth-worm is used, and generally with success. Live shrimps are also a taking lure.

[E.]

THE AMERICAN SALMON AND TROUT,

Including Introduced Species.

BY S. GARMAN.

“A short paper that shall enable us to identify the different species of salmon and trout that belong here, or that have been introduced” is one not easily supplied. Among fishes there is probably no group of its size that presents more difficulty in determination than theirs, the genus *Salmo*. Short descriptions that shall distinguish are almost impossible in many cases, without the aid of illustrations. A number of the species noted here have been supplied with outline figures, indicating certain shapes and markings on which stress has been laid in the text. It remains to supply a few definitions and explanations to make the work still more available for those not accustomed to the technical terms of the ichthyologist.

The foremost fin on the back is known as the *Dorsal* (D.), and the little fatty fin behind it as the *Adipose*; the tail fin is the *Caudal*; that behind the vent is the *Anal* (A.); the pair before the vent are the *Ventrals* (V.), and those close to the gills are called the *Pectorals* (P.) Between the ventral fins and the body there are little pointed scale-like appendages called *Ventral bracts*, one to each fin. The hinder part of the cheek forms the gill cover or *Opercle*. The *Branchial rays* are series of ten or more blade-like bony pieces on each side of the throat below the Opercles. A narrow elongate strip of bone on the upper jaw reaching past the corner of the mouth under the eye is the *Maxillary*. The *Vomerine Teeth* are in the middle of the roof of the mouth; in some species they form a small group just behind the front series between the forward ends of the Palatines, which lie toward the sides of the roof next the Maxillaries; in others they are continued backward for a shorter or longer distance in one or two rows. The *Lateral line* is a line of *Pores* and enlarged scales along the middle of the flank from head to tail.

The Head is measured from the snout to the end of the gill cover, on the side.

In counting the scales a longitudinal line is taken from the upper angle of the gill opening, the beginning of the line of pores, directly back to the caudal fin, keeping a short distance above the larger scales of the lateral line. Transverse series are counted from the dorsal to the lateral line, from the latter to the ventral, and again from the adipose fin to the same line. All of the *Fin rays*, bony supports of the fins, short and long, are counted.

B., 11 ; D., 14 ; A., 13 ; V., 9 ; P., 14, reads thus : Branchial rays, 11 ; rays in the dorsal fin, 14 ; in the anal, 13 ; in the ventral, 9 ; and in the pectoral, 14.

Scales, 40, 238, 43, reads : Scales from dorsal to lateral line, 40 ; from head to tail, 238 ; and from lateral line to ventral, 43.

The *Pyloric cæca* are a lot of tubes, closed at the outer end and attached by the other, at the lower end of the stomach on the intestine. So much for the terms used.

The descriptions and outlines have been taken from specimens of particular sizes. When larger or smaller examples are compared with them it will be necessary to make certain allowances on account of variation. If the fish is younger it will be more slender, its head and snout shorter, its eye comparatively larger, its maxillary shorter, and its tail more deeply notched ; if older, its body will be deeper, its head and snout longer, its eye comparatively smaller, its maxillary longer, and its caudal notch less deep. Besides these, the longer snout — hooked and distorted in some — the longer maxillary and higher coloration of adult and old males, as compared with females, is to be kept in mind. Owing to lack of specimens of the young of a number of the species for comparison, the coloration of the “parr” or banded stage has not been dwelt upon.

When all these variations are considered it will be seen that to make a complete description of a single species would take nearly as much space as has been allotted to this paper. In view of the prospect of confusion in future, from interbreeding and introductions, such descriptions would be especially desirable ; but, at present, from lack of material — series of specimens of each sex, from very young to very old, and of the different varieties of each species — they are impossible.

The genus *Salmo* includes all of the salmon and trout. It is characterized by the shape of the body, elongate fusiform ; the scales, small to medium, absent on the head ; the mouth, medium to wide ; the maxillary, extending under or behind the eye ; the small conical teeth, on the jaw-bones, the vomer, the palatines, and the tongue ; the anal fin, of eleven to nineteen rays ; the numerous

pyloric cæca; and the transverse bands, "parr marks," in the young.

Different authors have subdivided the genus into *Oncorhynchus* (the Pacific salmons), having more than fourteen rays in the anal fin, and teeth on both head and body of the vomer; *Salmo* (the salmons), having less than fifteen anal rays, and teeth on both head and body of the vomer; and *Salvelinus* (the charrs or trout), having less than fifteen anal rays, and teeth on the head of the vomer but none on its body.

The list below gives the species included in this paper. Larger collections and further study will be likely to reduce the number among those from the Arctic regions, and possibly those of the Pacific, by putting two or more together as one.

SALMO.

Oncorhynchus.

S. gorbusha.

S. keta.

S. tshawytscha.

S. hisutch.

S. nerka.

Salmo.

S. salar.

S. irideus.

S. gairdneri.

S. clarkii.

S. virginalis.

S. lewisi.

S. henshawi.

S. levenensis.

S. fario.

S. salvelinus.

Salvelinus.

S. namaycush.

S. siscowet.

S. oquassa.

S. naresii.

S. arcturus.

S. malma.

S. fontinalis.

S. agassizii.

S. hoodi.

S. rossi.

S. nitidus.

S. alipes.

S. stagnalis.

SALMO GORBUSCHA. *Humpback Salmon.*

Salmo gorbusha Walb., 1792, Art. Gen. Pisc., 69: *Salmo proteus* Pallas, 1831, Zoogr. Ross. Asiat., III, 376; Suckley, Monogr. Salmo, 97; Jord., 1878, Pr. U. S. Mus., I, 71: *Salmo gibber* Bl. Schneid., 1801, 409.

Salmo scouleri Rich., 1836, F. Bor. Amer., III, 158: *Oncorhynchus proteus* and *O. scouleri* Gunther, 1866, Cat., VI, 157, 158: *Oncorhynchus gorbusha* Jord., 1883, Bull. 16, U. S. Mus., 305.

B., 12 to 13; D., 14 to 15; A., 17; pyloric cæca, 180, more or less; scales small, 33, 210 to 240, 40; lateral line, 170; adipose fin to lateral line, 18.

Slender to moderately stout. Breeding males with a fat hump between the head and the dorsal, the jaws much produced and hooked, and with large teeth in front. Vomerine teeth in a double series. Maxillary slender, straight, extending behind the orbit; longer in the male. Ventral bract half or more of the length of the fin. Readily distinguished from other salmon of its region by the very small scales.

Silvery; back bluish, spotted posteriorly and on the tail with small spots of black. Males in season reddish, with brown markings.

This species attains a weight of five or six pounds. It occurs in the Northern Pacific, from California to Northeastern Asia. From descriptions.

SALMO KETA.

Salmo keta Walb., 1792, Art. Gen. Pisc., 72; Bl. Schneid., 1801, p. 407: *Salmo lagocephalus* Pallas, 1831, Zoogr. Ross. Asiat., III, 272: *Oncorhynchus lagocephalus* Gunther, 1866, Cat., VI, 161; Jord., 1883, Bull. 16, U. S. Mus., 305.

B., 13 to 14; D., 12; A., 16 to 17; pyloric cæca, 140 to 185; scales about 28, 150, 30.

A stout-bodied salmon, reaching a weight of twelve pounds; resembling the Quinnat in shape. Head perhaps a little longer than that of the latter, and broader about the snout. Maxillary extending considerably behind the eye. Ventral bract not half the length of the fin.

Brownish above, sides lighter. Sprinkled with small punctulations, often absent. Tail brownish, plain, or sprinkled like the back, edge blackish. Varying from light to very dark. Males in season with red color and markings on the flanks, becoming much distorted about the jaws, and deteriorating in quality of flesh. California to Kamtschatka. Not one of the best for introduction.

SALMO TSHAWYTSCHA. *Quinnat Salmon*. Fig. 1.

Salmo tshawytscha Walbaum, 1792; Artedi Gen. Pisc., 71: *Salmo orientalis* Pallas, 1831, Zoogr. Ross. Asiat., III, 367; Cuv. Val., 1848; Poiss., XXI, 356: *Salmo quinnat* Rich., 1836, F. Bor. Amer., III, 219; Storer, 1846, Synops., 196; Suckley, Wash. Terr. Nat. Hist., 321; U. S. Fish Com. Rep., pt. 2, 1874, 105; Girard, 1858, Pacif. R. R. Rep., Fish, 306, pl. 67: *Oncorhynchus orientalis* and *O. quinnat* Gunther, 1866, Cat., VI, pp. 158-9: *O. choweecha* Goode, Game Fishes, pt. 10, p. 41, pl.: *O. chowicha* Jord., 1883, Bull. 16, U. S. Mus., 306; Bean, 1883, Bull. 27, U. S. Mus., F, pp. 32, 38; 1884, Rep. Fish. Com., 1043.

B., 16 to 18; D., 14 to 15; A., 18; V., 10; P., 15; pores, 133 to 135; pyloric cæca, 140 to 180; scales, 28 to 30, 138 to 145, 30; adipose fin to lateral line, 15 to 17.

A specimen of twenty-four inches in length is stout, thick and moderately compressed. The head is moderate and subconical, slightly flattened on the sides; its length is less than the depth of the body and is scarcely contained four times in the length of body and head. Eye rather small, nearly three times in the length of the snout or nine times in that of the head. From a vertical on

the front edge of the eye the maxillary curves downward and broadens; it extends farther back than the eye. Vomerine teeth weak, in two series, scattering, or absent. Three or four of the dorsal rays behind the middle of the entire length. Ventral bract nearly equal the length of the fin. Caudal fin lunate, excavation about half the fin's length.

Color silvery, back dark to very dark. Back, flanks and fins generally with scattered small spots of dark.

A specimen of four and a half inches is much more slender. The head is less than one-fourth of the entire length. Snout less than the eye, blunt. Maxillary not reaching behind the eye. Eye four times in the length of the head. Middle of the entire length behind the dorsal. Caudal deeply notched, lobes somewhat convex.

Back brownish, puncticulate with brown; flanks silvery. The dorsal tipped with dark. Belly white. Parr-marks about twelve.

The most valuable of the salmons. Said to attain a weight of more than fifty pounds. Introduced in various streams of the Eastern States. Originally occurring in the Pacific, from California to China. Ascending the Columbia and other rivers in enormous numbers.

SALMO HISUTCH. *White Salmon.*

Salmo hisutch Walb., 1792, Art. Gen. Pisc., 70; *S. kysutch* Bl. Schneid., 1801, 407: *Salmo sanguinolentus* Pallas, 1831, Zoogr. Ross. Asiat., III, 379: *Oncorhynchus sanguinolentus* Gunther, 1866, Cat., VI, 160; *Oncorhynchus lycaodon* Gunther, 1866, Cat., VI, 155, part: *Salmo scouleri* Suckley, 1862, Monogr. Salmo, 94: *Salmo tsuppitch* Rich., 1836, F. Bor. Amer., III, 224; Gunther, 1866, Cat., VI, 118: *Oncorhynchus tsuppitch* Jord., 1880; Forest and Stream, 130; 1883, Bull. 16, U. S. Mus., 307: *S. kisutch* Jord., 1883, Bull. 16, U. S. Mus., 307.

B., 13 to 14; D., 13; A., 16 to 17; pyloric cæca, 45 to 80; scales, 25, 127, 29.

Body moderately stout and compressed. Head short, conical; snout blunt-pointed, longer and wider than lower jaw. Arch between eyes high. Eye quite small. Maxillary long, narrow, reaching behind the eye. Teeth few and small. Vomerine teeth few, those on the tongue feeble. Fins small; pectorals and ventrals short. Ventral bract more than half the length of the fin. Caudal pedicel slender; fin strongly forked.

Sides silvery, with punctulations of dark. Back bluish green. A few small spots on the upper surface, dorsal, and upper part of the caudal. Males reddish in the fall. Reaches a weight of eight

pounds. Abundant from San Francisco northward. Russian name, *Báyloee roóibah*, white fish. From description.

SALMO NERKA. Red Salmon.

Salmo nerka Walbaum, 1792, Artedi Gen. Pisc., 71; Bl. Schn., 1801, 417; Jord., 1883, Bull. 16, U. S. Mus., 308.

Oncorhynchus nerka Jord., 1883, Bull. 16, U. S. Mus., 308 (which see for synonymy).

B., 13 to 14; D., 15; A., 17; V., 10; P., 15; pores, 137; pyloric cæca, 75 to 95; scales, 20, 135 to 143, 20; adipose fin to lateral line, 14.

Body moderately stout. Head subconical, little more than four times in length of body and head. Eye twice in the snout and about eight times in the length of the head. Maxillary broad beneath the eye and extending behind its posterior border. Mouth with a wavy outline. Jaws of the males become elongate, the upper crooked and flexible, in the spawning season. Ventral bract more than half the length of the fin.

Back lustrous blue, olive in alcohol; head from above the eyes dark. Cheeks, sides and belly silvery. Young more or less spotted, and males in the spawning season more or less red. This fish attains a weight of seven or eight pounds. It is considered but little inferior to *S. tshawytscha*. Specimen described twenty inches in length, from Onalaska. Said to occur from the Columbia River to Kamtschatka. Called by the Russians *Krasnoóee roóibah*, red fish.

SALMO SALAR. Common Salmon. Figs. 2, 3 and 4.

Salmo salar Linné, 1758, Systema, I, 303, — 1766, Syst., 509; Agassiz, 1839, Poiss. d'eau douce, Tab. II; Gunther, 1866, Cat., VI, p. 11; Mitch., 1815, Trans. Lit. and Phil. Soc., I, 435; Rich., 1839, F. B. Am., III, 145; Dek., 1842, N. Y. Fauna, Fishes, p. 24, pl. 38, f. 122; Thompson, 1842, Nat. Hist. Vermont, 140; Storer, 1867, Fish Mass., p. 142, pl. XXV, f. 2; Jord., 1883, Bull. 16, U. S. Mus., p. 312; Bean, 1884, Rep. U. S. Fish Com., 1042; Goode, 1879, Game Fishes U. S., p. 5, pl.

Salmo gloveri Girard, 1854, Pr. Phil. Ac., 85; Holmes, 1862, 2d Maine Ann. Rep. Nat. Hist. and Geol., 115.

Salmo namatus Holmes, 1862, l. c. 117.

Salmo sebago Girard, 1853, Pr. Phil. Ac., 380; Suckley, 1874, Rep. U. S. Fish Com., 143; Gunther, 1866, Cat., VI, 153; Jord., 1880, Man. Vert., 272.

B., 11 to 12; D., 13 to 15; A., 11 to 12; V., 9; P., 14 to 15; pores, 109 to 119; pyloric cæca, 65; scales, 20 to 23, 121 to 136, 20 to 23; adipose fin to lateral line, 14 to 16; vertebræ, 60.

In large specimens of thirty inches or more the body is moderately stout and compressed. Head four and a half times in the length of body and head, subconical. Eye small, three times in the snout, nine in the head. The head of the male is three and a half times in the head and body, without the caudal, and the eye four and a half times in the snout and nine and a half in the head. Last ray of the dorsal near the middle of the entire length. When spread, the caudal margin has but a shallow concavity. Ventral bract not half the length of the fin. Maxillary of the female broader beneath the eye, pointed at the end, reaching a little behind the eye; in the male it is longer and bent downward below the orbit. In adult males the jaws are longer; the upper becomes much produced and turns downward, and the lower has a prominence on the symphysis that frequently turns backward as a hook.

Specimens of twenty inches in length have the snout about two and a half and the head about seven times the length of the eye.

Some are light silvery, with few or no spots on the back and none on the head; others are dark on the back and cheeks, and the flanks are spotted with black; still others, males in which the skin has thickened so as to hide the scales, are nearly black. Parr-marks, ten or eleven; the "parrs" are spotted with black and red. In a large series of specimens I am unable to find one possessed of the X-shaped marks referred to in the descriptions of the European examples.

The species established for the "land-locked salmon" has insufficient foundation. The characters on which it is founded are possessed by the individual, before he visits the sea, and lost during his marine excursion. If we admit that the differences in color, between those that have visited the sea and those that have not, are of specific value, we shall be compelled to place the same individual in different species at different periods of his existence. Figure 2 represents a male of thirty-one and a half inches, figure 3 a female of thirty-eight inches, unspotted, and figure 4 the head of a female with the spots on head and shoulders.

SALMO IRIDEUS. *Rainbow Trout.* Fig. 5.

Salmo iridea Gibbons, 1855, Pr. Cal. Acad., I, 36, 37: *Salmo irideus* Gunther, 1866, Cat., VI, 119; Suckley, 1874, Rep. U. S. Fish Com., pt. 2, 129; Jord., 1883, Bull. 16, U. S. Mus., 312; Bean, 1884, Rep. U. S. Fish Com., 1042: *Salar iridea* Girard, 1856, Pr. Phil. Ac., 220, — 1858, Pacif. R. R. Rep., Fish, p. 321, pl. 73, f. 5, and pl. 74.

B., 11; D., 14; A., 13 to 14; V., 10; P., 15; pores, 125; scales, 26, 140 to 155, 26; second dorsal to lateral line, 18.

Body moderately short and compressed. Head four and a half

times in the entire length; arch from eye to eye medium. Eye less than four and a half times in the length of the head, once in length of snout, and one and a half times in the interorbital space. Snout as long as the eye, blunt. Maxillary not reaching behind the eye; longer in large males. Two rays of the dorsal behind the middle of the entire length. Pectorals, in specimen figured, reaching a little more than half-way from their bases to those of the ventrals. Ventral bract not half the length of the fin. Caudal with a shallow notch. A row of about seven teeth on each side of the shaft of the vomer.

Back brown, with a bluish tint, closely set with spots of brown. Sides and belly dark with closely-placed punctulations of brown, with numerous spots of brown on the flanks. Larger spots of brown on head and cheeks. On the flank a series of eight parr-marks is included in a brick-red longitudinal band. Dorsal and caudal with many spots of brown. Caudal with a lighter band along its posterior border. The specimen figured is very dark; the species varies to very light and silvery. Specimen eight inches long, from a lot introduced in New England by the Fish Commissioners. In eighteen specimens from Carissima Creek, Cal., I find none so dark as the above. The disposition of spots is similar, but in cases, those below the parr-marks are larger. Streams west of the Sierras, from southern California to Oregon. Introduced in the Eastern States. Five to six pounds.

SALMO GAIRDNERI. *Gairdner's Salmon.* Fig. 6.

Salmo gairdneri Richardson, 1836, F. Bor. Amer., III, 221; Suckley, Monogr. Salmo, 114; Gunther, 1866, Cat., VI, 118; Jord., 1883, Bull. 16, U. S. Mus., 313: *Salmo purpuratus* Gunther, 1866, Cat., VI, 116: *Salmo truncatus* Suckley, 1862, Monogr. Salmo, 3; Gunther, 1866, Cat., VI, 118.

B., 12 to 13; D., 14 to 15; A., 13 to 14; V., 10; P., 15; pores, 123 to 129; scales, 25 to 27, 140 to 157, 25 to 28; adipose fin to lateral line, 17; pyloric cæca, 42; vertebrae, 58.

Description from a twenty-inch specimen from the Sacramento River. Body moderately stout, nearly as much so as that of *S. salar* of the same size. Head rather short, four and a half to five times in the entire length, compressed; crown well arched from eye to eye. Snout pointed, from two to two and a half times the eye. Maxillary curved downward below and reaching behind the orbit; longer and more slender in males. Vomerine teeth in two series. Caudal notch very shallow, obliterated on spreading the fin. Ventral bract long, not half the length of the fin. Adipose fin rather large. In the female the caudal notch is regular; in large males it appears as in Fig. 6.

Scales silvery. Back brownish (bluish in life), and, with upper part of flanks, the dorsals and caudal, thickly sprinkled with spots of brown. Belly yellowish or reddish. In the example figured, a male of seventeen inches, the lower jaw is turned upward with a knob on the symphysis. The species reaches a weight of twenty pounds. It is found about the mouths of the rivers from the Sacramento northward. It has harder, stronger bones than *S. tshawytscha*, and spawns later.

SALMO CLARKII. *Clark's Trout*. Fig. 7.

Salmo clarkii Rich., 1836, F. B. A., III, 225; Jord., 1878, Pr. U. S. Mus. I, 77.

Fario stellatus Girard, 1856, Pr. Phil. Ac., 219.

Salmo brevicauda Suckley, 1861, Ann. N. Y. Lyc., VII, 308; Gunther, 1866, Cat., VI, 120.

Salmo stellatus and *S. gibbsi* Gunther, 1866, l. c. 117, 119.

Salmo tsuppitch Jord., 1878, Pr. U. S. Mus., I, 72.

Fario aurora Girard, 1856, Pr. Phil. Ac., 219.

Salmo purpuratus Jord., 1883, Bull. 16, U. S. Mus., 315.

B., 11 to 12; D., 14 to 15; A., 14 to 15; V., 10; P., 15; pores, 129; pyloric cæca, 43; scales, 25, 151, 25; adipose fin to lateral line, 15.

Moderately stout and compressed. The head and body are four times the length of the head. Mouth large. Maxillary bent downward below and reaching behind the eye in the male; a little shorter and straighter in the female. Eye small; less than three times in the snout and seven and a half in the head. Snout long, lower jaw slightly hooked upward. Vomerine teeth in irregular series. Interorbital space high arched; width about three times that of the eye. The middle of the dorsal is in the middle of the entire length. Pectorals not reaching half-way from their bases to those of the ventral. Ventral bracts slender, elongate. Caudal notch very shallow.

Back, top of head, dorsals, and tail light brownish, spotted, more or less profusely, with small spots of brown. Flanks silvery, belly light yellowish. Varies in color from very dark, very spotted, to very light, silvery, with spots obsolete. Flesh white.

In a female from Lake Bigler, Cal., the head is less than a fourth of head and body, and the eye is twice in the length of the snout. A line through the middle of the entire length cuts off the posterior third of the base of the dorsal. Caudal notch shallow, regular. Colors as in preceding. Said to reach a weight of twenty pounds. Species found from California northward, with its varie-

ties ranging from California, New Mexico and Colorado northward. Specimen described seventeen inches in length; Fig. 7.

SALMO VIRGINALIS. Utah Trout. Fig. 8.

Salmo virginalis Girard, 1856, Pr. Phil. Ac., 220, — 1858, P. R. R. Rep., X, p. 320, pl. 73, f. 1-4.

Salmo virginalis Gunther, 1866, Cat., VI, p. 123.

Salmo spilurus Cope, 1871, Hayden's Rep., 470; Jordan, 1878, Pr. U. S. Mus., I, p. 74, — 1883, Bull. 16, U. S. Mus., 314.

Salmo pleuriticus Cope, 1871, Hayden's Rep., 471; Jordan, 1878, Pr. U. S. Mus., I, 74; Cope, 1874, Pr. Am. Phil. Soc., 132, — Surv. W. 100th Merid., V, 693.

Salmo spilurus var. *pleuriticus* Jord., 1883, Bull. 16, U. S. Mus., 314.

Salmo spilurus Subsp. *pleuriticus* Jord., 1878, Pr. U. S. Mus., I, 74.

B., 11 (10 to 12); D., 14 (14 to 15); A., 14 (14 to 15); V., 9; P., 15; pores, 126; scales, 36 to 38, 180 to 188, 38 to 42; adipose to lateral line, 25 to 27.

A variety of *S. clarkii*. Specimen described twelve and a half inches in length. Moderately stout and compressed, similar to *S. fontinalis*, perhaps a little more slender. Head well arched from eye to eye, four and a half times in the length of body and head. Snout blunt-pointed, near one and a half times the eye. Jaws about equal. Two series of vomerine teeth. Maxillary bent downward beneath the eye, extending behind the eye near half the diameter of the latter. Three rays of the dorsal behind the middle of the entire length. Caudal notch shallow, and pedicel rather deep.

Upper surface and tail brownish, flanks silvery. More or less thickly sprinkled with small brown spots, most numerous toward the tail, distinct on back and head, becoming smaller or obsolete toward the belly. Common in Colorado, Utah and New Mexico, reaching a weight of six pounds; flesh very fine, especially so in the mountain streams.

SALMO LEWISI. Lewis's Trout. Fig. 9.

Salmo lewisi Girard, 1856, Pr. Phil. Ac., 210, — 1858, Pacif. R. R. Rep., Fish, 318, pl. 72: *Salmo lewisii* Gunther, 1866, Cat., VI, 122: *Salmo purpuratus* var. *bouvieri* (Bend.) Jord., 1883, Bull. 16, U. S. Mus., 315, and var. *stomias* p. 316: *Salmo stomias* Cope, 1870, Hayden's Rep., 433; Jord., 1878, Hayd. Rep., 316.

B., 10; D., 13 (13 to 14); A., 13 (13 to 14); V., 9; P., 14 to 15; pores, 127 to 133; scales, 37 to 38, 197 to 210, 38 to 42; adipose to lateral line, 23.

A specimen of eight and a half inches has the shape and proportions of *S. clarkii*, of which it is a variety. The caudal notch

is slightly deeper. The spots are more numerous, especially toward the tail; apparently they are of two kinds on this specimen: small, very black ones on the outside, profusely scattered over back, flanks and fins, and larger ones that seem to lie beneath the scales in the skin, forming irregular series along the sides. Head waters of the Missouri from Colorado northward; in the mountains of Dakota and Montana.

SALMO HENSHAWI. *Henshaw's Trout.*

Salmo henshawi Jordan, 1878, Man. Vert., 358, — 1878, Pr. U. S. Mus., I, 75: *S. henshawi* and *S. tsuppitch* Jord., 1878, Chief Eng. Rep. App. NN. pp. 196, 197, fig.

B., 11; D., 12; A., 14; V., 9; P., 14; pores, 127; pyloric cæca, 50 to 60; scales, 36, 160, 38; adipose fin to lateral line, 23.

Specimen described a female thirteen and a half inches long, from Donner Lake, Cal. Moderately slender and compressed. Head little less than four and a half times in the length of body and head; snout short, blunt, rounded, length about one and a half times that of the eye. Eye rather large, six times in the length of the head. Maxillary long, nearly straight, extending behind the eye. One or two rays of the dorsal behind the middle of the entire length. Caudal notch shallow, posterior margin slightly concave when the fin is spread.

Upper part of flank light reddish brown, back darker, belly lighter. Back, sides, head and fins with scattered spots of brown, the larger about an eighth of an inch in diameter, growing smaller toward the belly. Attains a weight of ten pounds or more. An excellent trout, common in the Truckee River, and the lakes, Tahoe, Donner and others, from which it receives its waters.

SALMO LEVENENSIS. *Loch Leven Trout.*

Salmo levenensis Walker, 1811, Wern. Mem., I, 541; Yarrell, 1839, Brit. Fish, ed. 1, suppl., p. 9, — ed. 2, II, 117, — ed. 3, I, 257; Gunther, 1866, Cat., VI, 101.

Loch Leven Trout Richardson, 1836, Fauna Bor. Amer., Pisc., 143.

D., 13; A., 11; P., 14; V., 9; lateral line, 118; transverse line, $2\frac{3}{8}$; pyloric cæca, 60 to 80; vertebræ, 59.

Head rather small. Body elongate. Snout of moderate length, conical, not much produced in the male, in which a mandibular hook has not been noted. Maxillary, narrow, feeble, reaching as far back as the eye in large specimens, or little farther. Teeth moderate. A series of two or three teeth across the base of the vomer. On the body of the vomer the teeth are in a single series. Caudal emarginate, when stretched to the utmost appearing truncate. Middle

rays of tail half as long as outer ones in older specimens. Hind part of body rather slender.

Brownish or greenish olive above; sides of the head with round black spots; sides of the body with more or less numerous X-shaped or rounded brown spots. Dorsal and adipose fins with numerous small brown spots; end of pectoral light blackish; dorsal and anal without black or yellow margin. Reaches a weight of upwards of four pounds.

Found in Loch Leven and other lakes in southern Scotland and northern England. One of the most recent introductions in the United States. Not migratory. From description.

SALMO FARIO. *River Trout.*

Salmo fario Turton, Brit. Faun., 103; Donovan, Brit. Fish, IV, pl. 85; Flem., Brit. An., 181; Rich., F. Bor. Amer., 144, pl. 92; Jenyns, Man. Vert., 424; Yarrell, Brit. Fish, ed. 2, II, 85, — ed. 3, I, 261; Day, Fish Brit. and Ireland, V, 95, pl. CIX, f. 3, CXIII, CXIV, CXVI, f. 1; Bean, 1884, Rep. Fish Com., 1043.

Salmo fario aussonii Gunther, 1866, Cat., VI, 64.

D., 13 to 14; A., 10 to 11; V., 9; P., 13; pyloric cæca, 38 to 50; scales, 26, 120, 30; vertebræ, 56 to 58; adipose fin to lateral line, 16 rows.

Body rather stout. Head medium. Snout somewhat produced in males, lower jaw hooked in very old ones. Maxillary strong, dilated, extending as far back as the eye in young specimens, and farther in those of ten inches or more; longer in males. Teeth strong. Vomer with a transverse series of teeth at its base and a double series along its body. Fins moderate, rounded. Caudal fin with a shallow notch in the young, becoming truncate early in life.

Flanks, head, back, and dorsal with spots of red and of black. Usually the first rays of dorsal, anal and ventrals are yellowish.

Found in the fresh waters of Central and Northern Europe and England, whence it has been introduced in the United States. Reaches a length of thirty inches, the female, according to Dr. Gunther, becoming mature when not more than eight.

SALMO SALVELINUS. *Saelbling.*

Salmo salvelinus Linné, 1758, Syst., 309, — 1766, Syst., 511; Bloch, Fische Deutschl., taf. 99; Meidinger, Ic. Pisc. Austr. tab. 22; Cuv. Val., 1848, Hist. Poiss., XXI, 246; Heckel, 1851, Sitzb. Ak. Wien, p. 89; Heck. and Kner., 1858, Susswasserf., 280; Siebold, 1863, Fische Europe, 280, part.; Gunther, 1862, Pr. Zool. Soc. Lond., 38, — 1866, Cat., VI, 126; Bean, 1884, Rep. Fish Com., p. 1042.

Salmo umbla Agassiz, 1839, Poiss. d'eau douce, pl. 9.

D., 12 to 14; A., 13; V., 9; P., 13 to 14; pyloric cæca, 36; vertebræ, 64; scales, 29, 204 to 220, 28.

Elongate and somewhat compressed. Head about four and a half times in the entire length. Maxillary broadening behind its middle, reaching as far back as the eye in small specimens, becoming longer with age. In a twelve-inch trout the eye is nearly five times in the length of the head, twice in the interorbital space, and less than twice in the length of the snout. Teeth rather weak. Vomerine teeth few, on the head of the bone. Fins medium. Ventral bract not half the length of the fin. Caudal notch deeper than that of *S. fontinalis*, not half the depth of the fin. Caudal pedicel slender.

Back olivaceous, or brownish; flanks silvery; belly yellowish. The silvery color of the lower cheek is rather sharply limited by the darker color extending from the top of the head as far down as the eye. In the specimens before me the dark color of the back extends down the flank to the lateral line. In the figure given by Prof. Agassiz, it includes the entire flank. Sides sprinkled with spots of light color. Young with the parr-marks have a few small red spots in addition to these. Lower surface, orange in the spawning season; lower fins with white anterior margins. Alpine lakes of Bavaria and Austria. Recently introduced in the United States.

SALMO NAMAYCUSH. Lake Trout. Figs. 10, 11.

The Namaycush Pennant, 1792, Introd. Arct. Zool., p. 298, — Arct. Zool., II, Suppl., 139.

Salmo namaycush Walb., 1792, Art. Gen. Pisc., 68; Rich., 1836, F. Bor. Amer., III, 179, pl. 75, pl. 85, f. 1; Kirtl., 1842, Bost. Jour. N. H., IV, p. 25, pl. 3, f. 2; Agass., 1850, Lake Superior, 331; Gunther, 1866, Cat., VI, 123; Donnd., 1798, Zool. Beytr., III, 647.

Salar namaycush C. V., 1848, Hist. Poiss., XXI, 348.

Salmo amethystinus Mitch., 1818, Jour. Ac. Sci. Phil., 410; Dek., 1842, New York Fish, 240, pl. 76, f. 241; Storer, 1846, Synops., 193.

Salmo toma Hamlin, Brochure on the Togue; Holmes, 1862, 2d Ann. Rep., Maine, 109.

Salmo confinis Dek., 1842, N. Y. Fish, 238.

Salmo symmetrica Prescott, 1851, Am. Jour. Sci., XI.

Cristivomer namaycush Jord., 1880, Man. Vert., 359; Goode, 1879, Game Fishes, p. 33, pl.

Salvelinus namaycush Jord., 1883, Bull. 16, U. S. Mus., 317; Bean, 1884, Fish Com. Rep., 1042.

B., 11 to 12; D., 14; A., 13, to 14; V., 10; P., 14 to 15; pores, 117 to 136; scales, 28 to 30, 185 to 210, 26 to 32; adipose fin to lateral line, 23.

Rather stout, moderately compressed. Head large, about one-fourth of the entire length; crown flattened; snout broad, rounded; jaws about equal. Maxillary strong, extending behind the eye,

longer in old examples. Teeth strong, in a single series on the vomer. Eye large; in a fourteen-inch specimen it is half the length of the snout, one-sixth that of the head, and half the width of the interorbital space. Opercles smooth. Fins medium; caudal notch deep, more than half the fin. Ventral bract short. Adipose fin of moderate size. Head longer and jaws more crooked in old males. Fig. 10 twenty-four, and Fig. 11 fourteen inches.

Grayish brown, very light to very dark, with pale spots on the sides, and dark marblings on the cheeks. Belly silvery. Dorsal and caudal spotted with light. Large specimens from the Lac des Neiges, Canada, are almost black (probably a good variety), others from New York are light grayish. Flesh reddish. One of the largest of the *Salmonidæ*. A thirty-one inch specimen weighed near fifteen pounds. The great lakes and their tributaries, eastward to the Atlantic, northward to Hudson's Bay. Generally not so fat as the variety *Siscowet*, of Lake Superior.

SALMO SISCOWET. *Siscowet*. Fig. 12.

Salmo siscowet Agassiz, 1850, Lake Superior, p. 333, pl. I, fig. 3; Gunther, 1866, Cat., VI, 124; Jordan, 1876, Man. Vert., 261: *Salmo namaycush* var. *siscowet*, Jordan, 1883, Bull. 16, U. S. Mus., 318.

B., 11 to 12; D., 14; A., 14; V., 9; P., 14; pores, 124; scales, 30, 200 to 207, 30; from adipose to lateral line, 23.

Moderately stout, short and deep. Head very little more than three and a half times in the length; without caudal; nearly flat; slightly convex between the eyes. Snout broad, rounded; its length equals the width of the interorbital space. Median keel of skull low. Eye about twice in length of snout, and six and a half times in that of the head. A median series of teeth on the vomer anteriorly. Maxillary of moderate width, elongate, reaching some distance behind the eye. When dried the opercles are seen to be striate, with grooves radiating from the bases of the bones. Scales small, with concentric striæ. Caudal deeply notched, nearly half the depth of the fin. The middle of the dorsal is about the middle of the entire length. Three of the posterior rays of the dorsal stand over the ventral. Usually very fat. Originally found in Lake Superior; introduced in various waters by the Fish Commissioners. Specimen figured nineteen and a half inches in length.

SALMO OQUASSA. *Blue Back*. Fig. 13.

Salmo oquassa Girard, 1854, Pr. Phil. Ac., 262; Holmes, 1862, 2d Ann. Rep. Nat. Hist. and Geol., Maine, 113; Gunther, 1866, Cat., IV, 154; Jord., 1876, Man. Vert., 260, and 1880, 272: *Salvelinus oquassa* Jord., 1880, Man. Vert., 360, — 1883, Bull. 16, U. S. Mus., 318.

B., 10; D., 12 to 13; A., 12; V., 9; P., 12; pores, 138 to 140; pyloric cæca, 32; scales, 30 to 34, 202 to 214, 30 to 36; adipose fin to lateral line, 23.

Species small, slender. Specimen described about nine and a half inches in length. Head rather small, about four and three-fourths times in the length of body and head; arch of the crown between the eyes very low, the space being nearly twice the diameter of the eye. Snout elongate, pointed, lower jaw little the longer. Eye one and a half times in the length of the snout, twice in the interorbital space, and near six times in the length of the head. Maxillary not reaching a vertical from the posterior border of the eye. Last ray of dorsal in the middle of the entire length. Ventrals short, bract not half the length of the fin. Caudal peduncle slender; notch deep, not half the fin; posterior margin sinuous. Adipose fin elongate, narrow.

Back blue in life, olivaceous in alcohol. The sides have a rich reddish tint in the dark color. Scales of lower part of sides and of the belly silvery. Eleven parr-marks on the side. In the larger specimens these marks are not distinctly defined, though quite visible. Sides thickly sprinkled with small pale spots, red in life, which become smaller above the lateral line.

Found only in Maine, in the Rangeley lakes, their tributaries and outlets; Androscoggin River.

SALMO NARESII. *Nares's Trout.*

Gunther, 1877, Pr. Zool. Soc. Lond., 476; Jord., 1884, Bull. 16, U. S. Mus., 318.

B., 11; D., 13; A., 11; pyloric cæca, 28 to 42; vertebrae, 63 to 65.

Body much elongate. Head one-fourth to two-ninths of the total, without caudal. Snout obtuse; forehead flat. Maxillary reaching hind margin of eye in males; shorter in females. Teeth very small; vomerine on front end of vomer; a band of villiform teeth along the middle of the hyoid bone. The gill-cover shows scarcely a trace of the radiating and concentric striæ by which *S. nitidus* is characterized. Scales minute.

Light greenish olive above; sides silvery, with very small red spots; deep reddish pink below. Dorsal and upper part of caudal dark; lower fins deep red, with yellowish white margins. Lakes of the Arctic regions, in the neighborhood of Discovery Bay and Cumberland Gulf, in depths of ten to fifteen fathoms. Largest example ten inches; others, male and female, only eight, with sexual organs fully developed, and the ova ready for extrusion. From description.

SALMO ARCTURUS.

Gunther, 1877, Pr. Zool. Soc. Lond., 294, pl. XXXII; Jord., 1884, Bull. 16, U. S. Mus., 319.

B., 11; D., 13; A., 12; pyloric cæca, 31 to 42.

Body rather elongate. Head small, scarcely one-fifth of the total length, without caudal. Snout very obtuse. Maxillary reaches about to the hind margin of the orbit in males; shorter in females. Teeth small; vomerine limited to front end of vomer; a band of villiform teeth along the middle of the hyoid bone. Caudal moderately excised. Scales minute.

Dull brownish green above; silvery or reddish below. Dorsal and caudal dark; lower fins yellowish. No dots or ocelli. Young with numerous parr-marks.

Specimens twelve inches long are full-grown. Victoria Lake, N. Lat., 82° 34'; Floeberg Beach, N. Lat., 82° 28'. From description.

SALMO MALMA.

Salmo malma Walbaum, 1792, Artedi, Gen. Pisc., 66; Jord., 1883, Bull. 16, U. S. Mus., 319 (which see for synonymy).

B., 11; D., 14; A., 11 (12); pyloric cæca, 45 to 50; scales, 39, 240, 36.

Stouter than *S. fontinalis*, sub-round. Head long, less than four times in the length, without caudal. Snout rather pointed, more than twice the length of the eye, broad. Adipose fin large; other fins short. Caudal with a very shallow notch. Opercles smooth.

Olivaceous; sides with round spots of red, smaller spots of light color on the back. Lower fins with a narrow light stripe, followed by one of dark color. Spots faint or obsolete to very distinct. Color varying from light to very dark. Said to reach a weight of twelve pounds. Kamtschatka to the Northwestern United States. Visiting the seas.

SALMO FONTINALIS. *Brook Trout*. Figs. 14, 15, 16.

Salmo fontinalis Mitchill, 1815, Trans. Lit. and Phil. Soc. N. Y., 435; Rich., 1836, F. B. Amer., p. 176, pl. 83, f. 1; Dek., 1842, Fish N. Y., 235, pl. 38, f. 120; Gunther, 1866, Cat., VI, p. 152: *Salvelinus fontinalis* Jord., 1878, Pr. U. S. Mus., 82; Goode, 1879, Game Fishes, pt. 1, p. 7, col. plate; Jord., 1883, Bull. 16, U. S. Mus., 320; Bean, 1883, Bull. 27, U. S. Mus., 41, — 1884, Rep. U. S. Fish Com., 1041: *Baione fontinalis* Dek., 1842, Fish N. Y., 244, fig. 58, — *Salmo erythrogaster* Dek., l. c. 236, fig. 126: *Salmo canadensis* Smith, 1834, Griff. Cuvier, X, 474: *S. immacu-*

A. Storer, 1850, Bost. Jour. N. H., 364; *Gunther*, 1866, Cat., VI, 125
S. hudsonicus Suckley, 1861, Ann. N. Y. Lyc., 310; *Gunther*, l. c. VI, 153.
Jord., 1878, Pr. U. S. Mus., I, 81.

B., 10 to 11; D., 13 to 14; A., 11 to 12; V., 8; P., 13 to 14; scales, 40 to 44, 200 to 240, 40 to 46; second dorsal to lateral line, 28; pores, 107 to 118.

Body moderate, slightly compressed, stout in large specimens. Head medium, low arched between orbits, blunt-pointed at snout. In a ten-inch female the head is four and a half, and in a ten-inch male it is three and a half times in the total length, without caudal. The diameter of the eye of the female figured is less than one and a half times in the length of the snout, while that of the male is more than twice. In the former this diameter is contained five and a half times, and in the latter six and a half times in the length of the head. Of a twenty-one inch female the head was less than the depth of the body, and but four and a half times in the entire length; the eye was one and a half times in the length of the snout and seven in that of the head. Maxillary reaching behind the eye, longer and more curved in adult males. Last ray of dorsal about the middle of the entire length. Pectorals reaching near half way from their bases to those of the ventrals. Ventral bract rather small.

In young ones the caudal notch is shallow. Spreading the fin to its utmost nearly or quite obliterates the notch in larger specimens. In that figured, fig. 16, and others from the same region, the upper half of the caudal is convex in its lower portion, which gives the margin a sinuous outline.

Back, and top of head, brownish, more or less vermiculate and spotted with darker. Dorsal and tail irregularly banded or spotted with brown. Sides sprinkled with round pale spots, red in life. A bridle or crescent (of brown) from one nostril to the other, convex forward. In the breeding season the outer border of the lower fins is whitish, and parallel with this, near the edge, is a dark line; the males have chin, throat and lower edge of each flank more or less marked with dark color, and their lower surface becomes brilliant reddish, or orange and cream color. Reaches a weight of eight pounds. A fine one, sent in by Commissioner Hayes, was twenty-one inches in length and of about four pounds weight.

Found in the Great Lakes, their tributaries, the region eastward to the Atlantic and southward to Alabama.

Figure 14 represents a ten-inch male, figure 15 a female of about eleven inches, and figure 16 a female of twenty-one. The latter differs in various respects from the others, as in the nearly uniform brownish of the back, shape of caudal, etc. A knowledge of

the younger stages from the same locality may lead to the separation of this form. Its shape resembles that of the salmon.

SALMO AGASSIZII. Figs. 17, 18.

B., 11 to 13 ; D., 12 to 13 ; A., 10 to 12 ; V., 8 to 9 ; P., 14 to 15 ; pores, 109 to 119 ; scales, 38 to 42, 217 to 237, 38 to 42 ; second dorsal to lateral line, 28.

A variety of the brook trout ; apparently restricted to the small lakes in the neighborhood of Dublin, New Hampshire. Compared with those of *S. fontinalis*, the young are rather more slender, the caudal notch slightly deeper, and the sides more silvery. The young are much darker colored than the adults ; on both the red spots of the flanks are large and numerous. On the adult figured, fig. 18, the brown color has become so much bleached that the specimen is nearly uniform silvery ; very faint indications of the red spots remain. The differences between the young of *S. fontinalis* and those of this variety are even more marked than those between adults ; side by side, the clouded parr-marks or bands at once distinguish the young of *S. agassizii*. Apparently it is later in attaining sexual development, and has the appearance of a deep water species. Fig. 17, seven and a half inches.

Snout longer than eye ; maxillary extending behind orbit ; in young (fig. 17) the diameter of the eye equals the length of the snout, and the length of the head is one-fourth of the total, without caudal ; the length of the head of a twelve and a half inch specimen (fig. 18) equals the depth of the body, and is contained four and three-fourths times in the length of the body and head.

Dublin Pond ; Lake Monadnock, Keene, N. H. ; Center Pond.

SALMO HOODII. *Hood's Trout.*

Salmo hoodii Rich., 1836, Fauna Bor. Amer., III, 173, pl. 83, f. 2, pl. 87, f. 1, — Ross's Voy., Nat. Hist. App., p. 58 ; Gunther, 1866, Cat., VI, 150 : *Salvelinus hoodi* Jord., 1883, Bull. 16, U. S. Mus., 321.

B., 10 to 11 ; D., 12 ; A., 11 ; V., 8 to 10 ; P., 13 to 15 ; scales, 28, 268 ; lateral line, 126.

Elongate. Head little more than a sixth of the entire length. Maxillary reaching behind eye. The species is somewhat closely allied to *S. fontinalis* in general appearance.

“Back and sides intermediate between olive-green and clove-brown, bestudded with yellowish-grey spots as big as a pea ; a few of these spots on the gill covers. . . . Dorsal and upper lobe of the caudal marked with smaller spots.” Specimen described twenty-one inches long. Flesh red.

Mingan River to Boothia Felix. From description.

SALMO ROSSII. *Ross's Trout.*

Salmo rossi Richardson, 1836, Fauna Bor. Amer., III, 163, pl. 80, — Ross's Voy., Nat. Hist. App., p. 56; Suckley, Monogr. Salmo, 120; Jord., 1883, Bull. 16, U. S. Mus., 321.

B., 12 to 13; D., 13; A., 11; V., 10; P., 14; scales, 30, 240; lateral line, 134.

Slender. Snout obtuse; lower jaw very long, terminating in an incurved knob (in males). Head one-fifth of the length of body and head. Pores on head and face very conspicuous.

"The back, top of head, dorsal and caudal fins, have a hue intermediate between oil-green and hair-brown; the cheeks are nacreous, and the sides pearl-gray, with a blush of lilac and a silvery lustre; there are a number of scattered dots of carmine in the vicinity of the lateral line; the color of the belly varies in different individuals from faded orange to tile-red and arterial blood-red."

Sir John Richardson says of this species: — "*Salmo Rossii* is so extremely abundant in the sea, near the mouths of the rivers of Boothia Felix, at certain seasons, that three thousand three hundred and seventy-eight individuals were obtained at one haul of a small-sized seine. They varied in weight from two to fourteen pounds, and rather exceeded, in the aggregate, six tons. In some the color of the flesh was of a dark red, in others it was very pale, the dark ones being the firmest and best flavored." Later writers have not recognized the species.

SALMO NITIDUS.

Salmo nitidus Richardson, 1836, Fauna Bor. Amer., III, p. 171, pl. 82, f. 1, pl. 86, f. 2, — Nat. Hist. App., Ross's Voy., p. 57; Gunther, 1866, Cat., VI, 150.

Salvelinus nitidus Jord., 1883, Bull. 16, U. S. Mus., 321.

B., 11 to 12; D., 14; A., 12; V., 10; P., 17; scales, 36, 270 (215 Gunther), 42; lateral line, 120.

Elongate. Head moderate, one-fifth or a little more of the entire length. Snout about twice the length of the eye. Maxillary straight, strong, extending as far back as the eye, farther in males. Teeth medium. Teeth not only on the head of the vomer, but also two or three behind it. Caudal fin conspicuously emarginate, the middle rays being about half as long as the longest. The orbit is one and a half times its length from the tip of the snout, or six times in the head. Opercles with radiating and concentric striae.

"Body above the lateral line deep green, softening towards the belly, which is of a beautiful yellowish-red tint posterior to the pectoral fins; throat and region of the pectorals white, slightly clouded

by yellowish-red. There are several rows of ocellate red spots, confined principally to the space between the lateral line and yellowish-red of the belly; they vary in size, the largest being as big as a pea. Dorsal fin colored like the back. Under fins dusky-red, the anal paler, and the first rays of the pectorals, ventrals and anal white." Lakes in Boothia. The specimens described were twenty-one inches in length. From description.

SALMO ALIPES. Long Finned Trout.

Richardson, 1836, *Fauna Boreali Amer.*, III, p. 169, pl. 81, pl. 86, f. 1, and *Nat. Hist. App.*, *Ross's Voy.*, p. LVII; *Gunther*, 1866, *Cat.*, VI, 149, and 1877, *Pr. Zool. Soc.*, 476; *S. stagnalis* *Jordan*, 1883, *Bull.* 16, U. S. Mus., p. 321.

B., 11 to 12; D., 12 to 13; A., 11; lateral line, 210; pyloric cæca, 41.

Elongate. Head moderate; snout elongate, pointed; lower jaw extending beyond upper in adults. Teeth small. Maxillary narrow, reaching behind eye. Operculum and sub-operculum very conspicuously and densely striated, the striæ radiating from the base of each of the bones. Fins much developed. Pectoral reaching more than half the distance from its root to that of the ventral, which also is long. Adipose small. Caudal conspicuously emarginate, even in old examples.

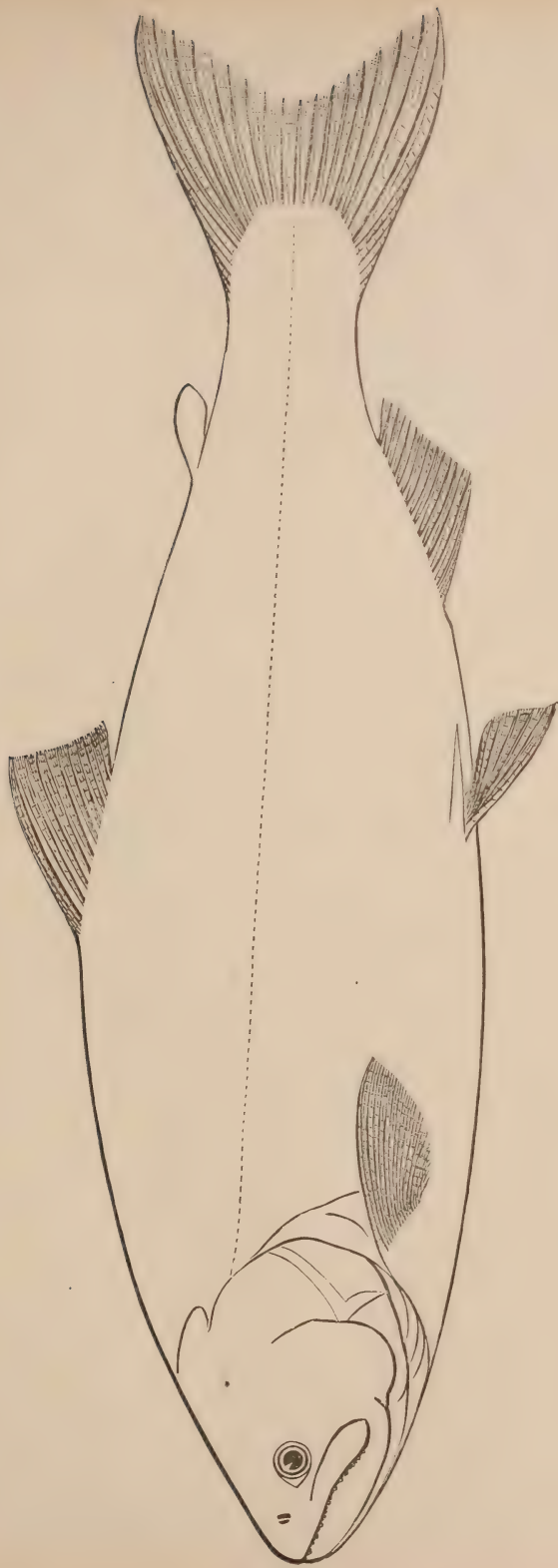
"Of this species two examples were obtained, about fifteen inches long; it is a well-marked species of Charr, characterized by the deep radiating and concentric striation of the gill covers. The typical specimens were obtained in Boothia Felix, so that this Charr has an unusually wide range. Color silvery, with scarcely any pinkish tinge." From description.

SALMO STAGNALIS. Fig. 19.

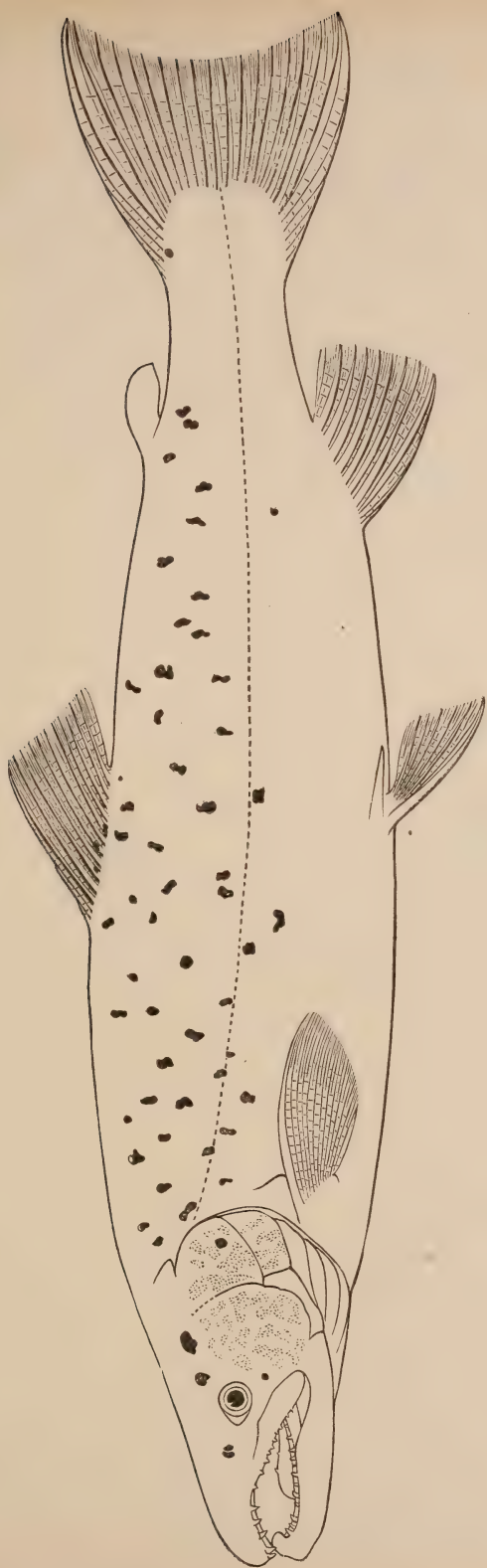
Salmo stagnalis *Fabricius*, 1780, *Fauna Groenlandica*, 175.

B., 10 to 11; D., 13 to 14; A., 12 to 13; V., 9; P., 14; pyloric cæca, 48; scales, 30, 200 to 204, 30; adipose fin to lateral line, 25 to 27; pores in lateral line, 130.

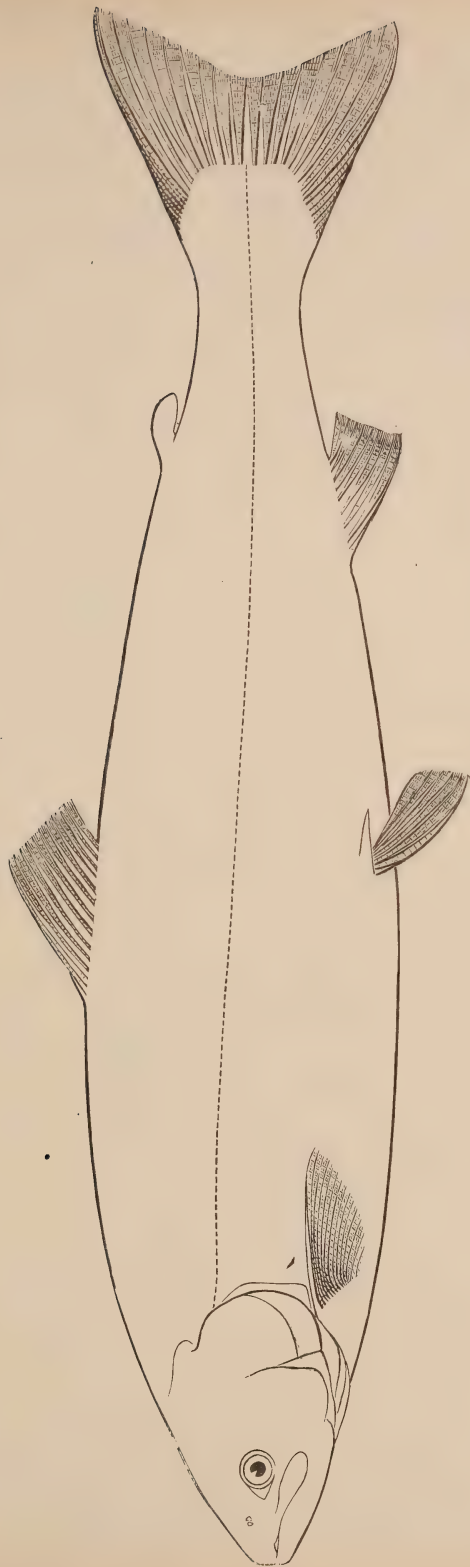
Slender, elongate. Head scarcely one-fifth of the total length, without caudal; crown between orbits high, skull with a considerable crest. Eye small, less than half the length of the snout. Jaws equal. Maxillary extending very little behind the eye in the male; shorter in the female. Pre-opercle rounded; the lobe shown in the specimen drawn does not appear in the female. Bones of



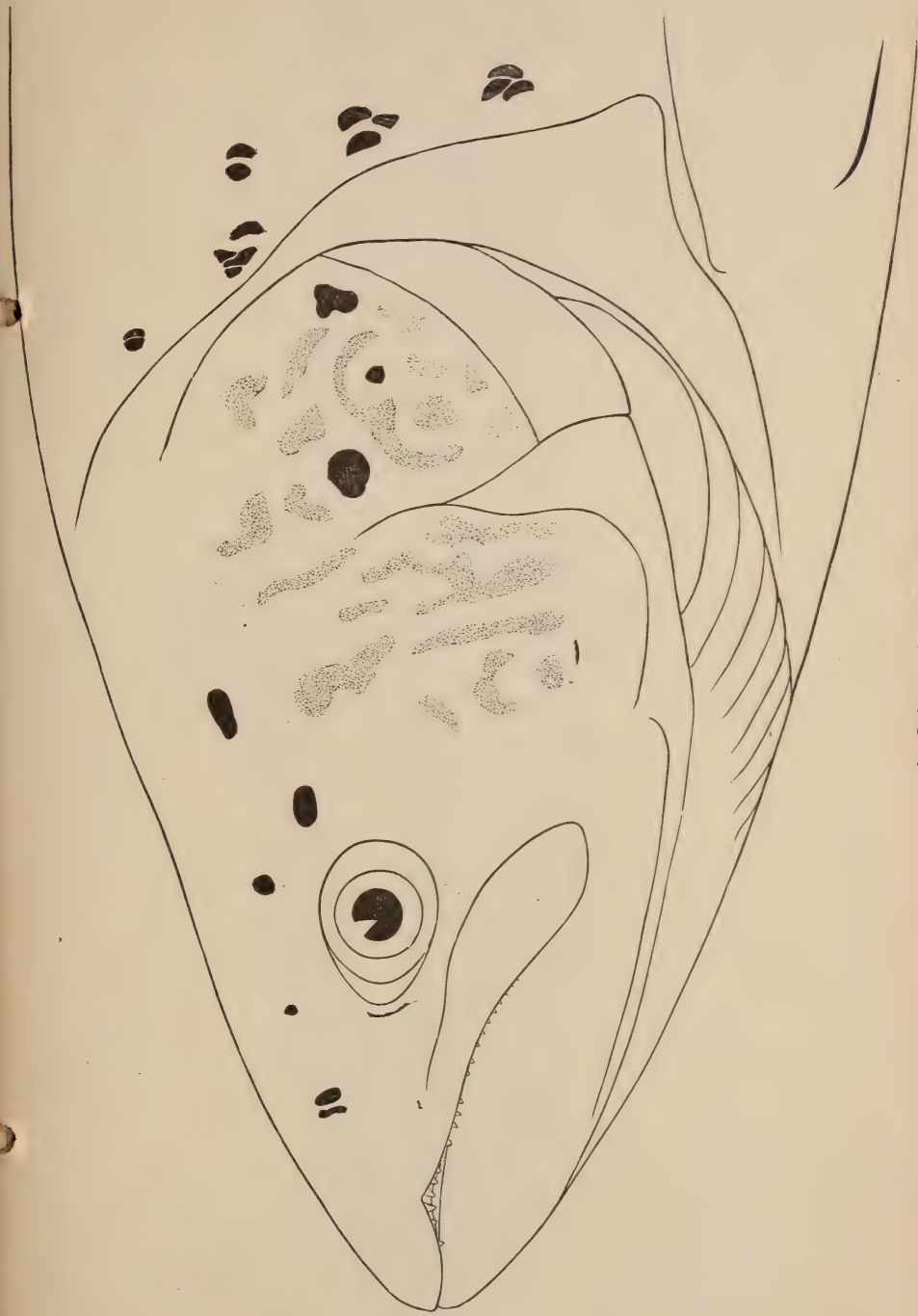
1. *Salmo ishawytscha*. Female.



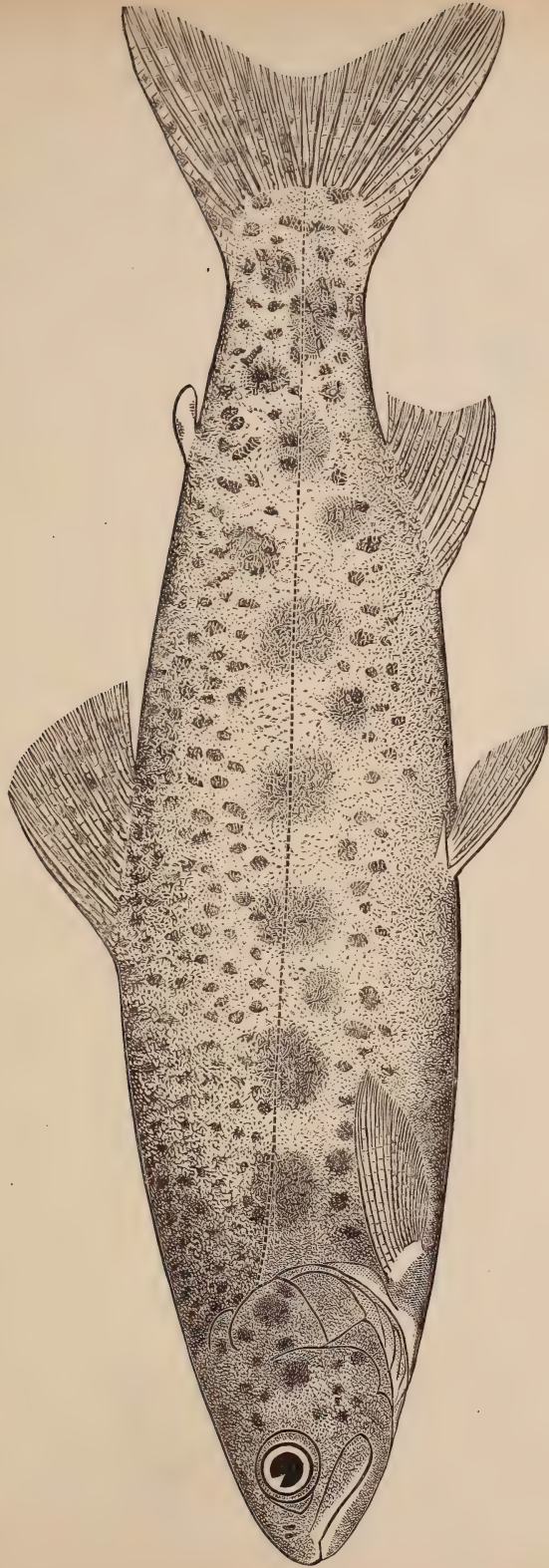
2. *Salmo salar*. Male.



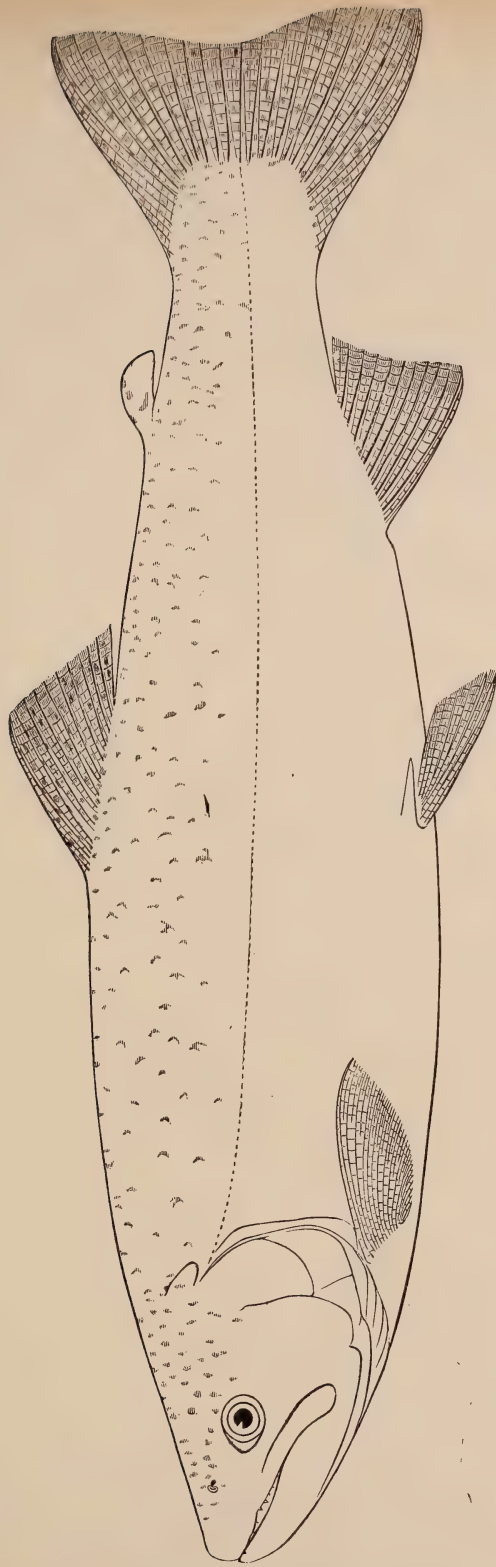
3. *Salmo salar*. Female.



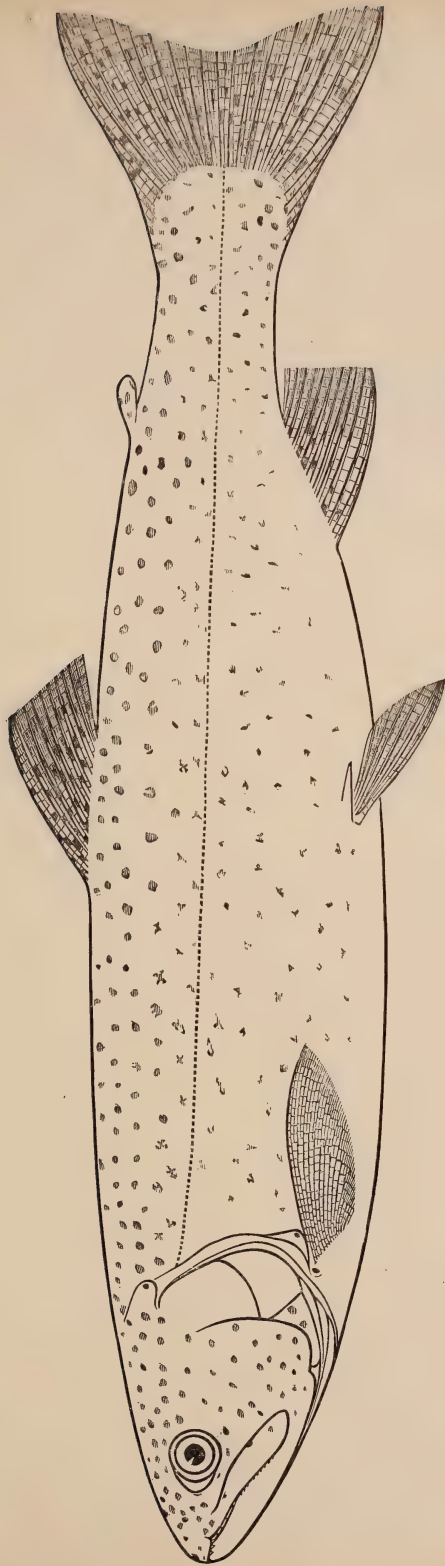
4. *Salmo salar*. Female.



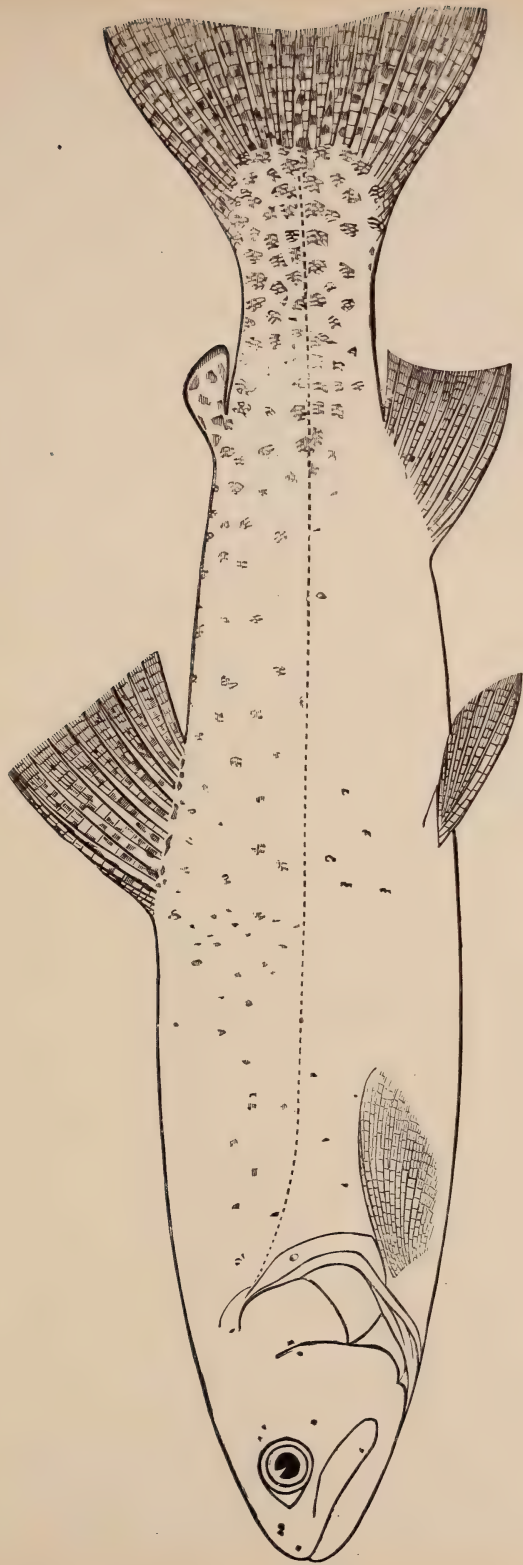
5. *Salmo irideus*. Male.



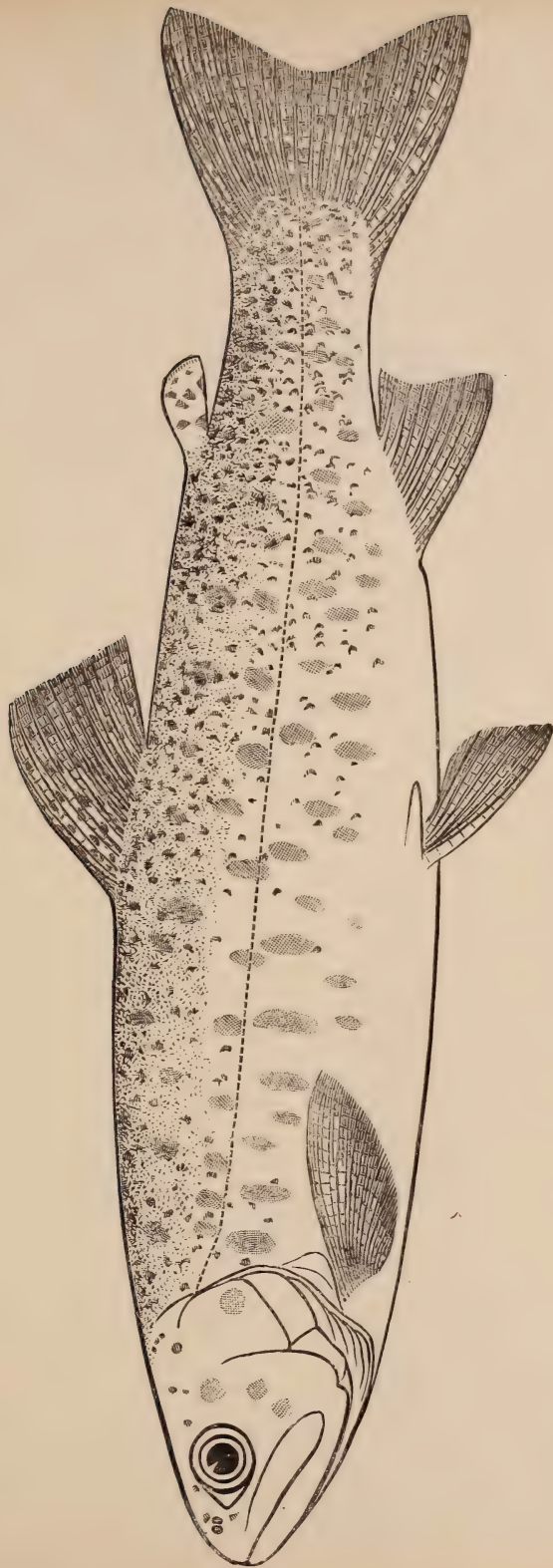
6. *Salmo gairdneri*. Male.



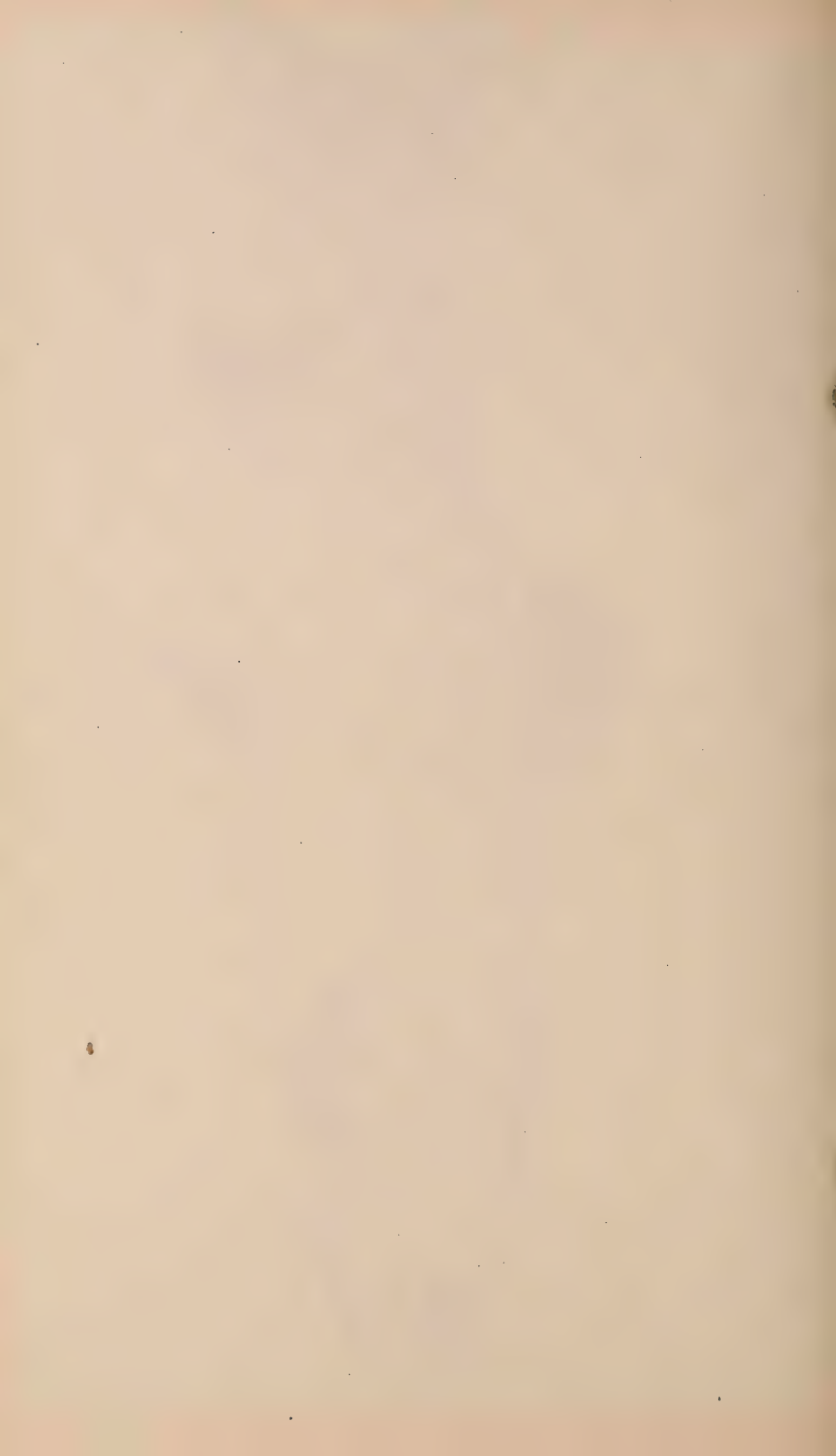
7. *Salmo ciarki*. Female.

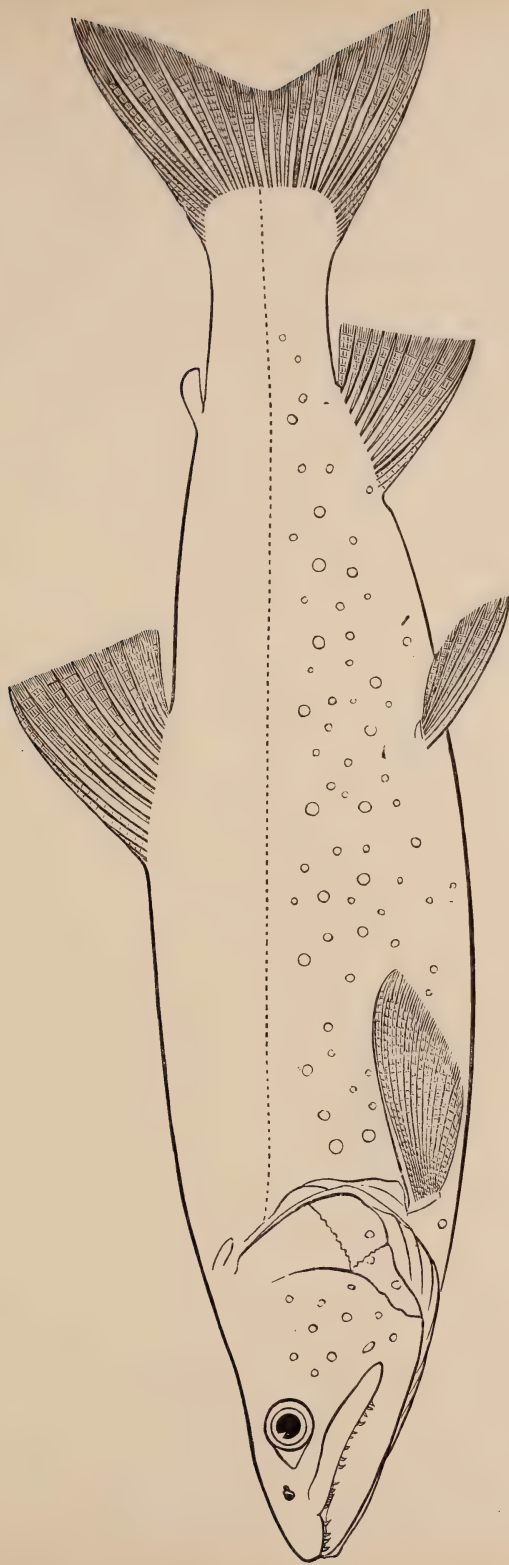


8. *Salmo virginalis*.

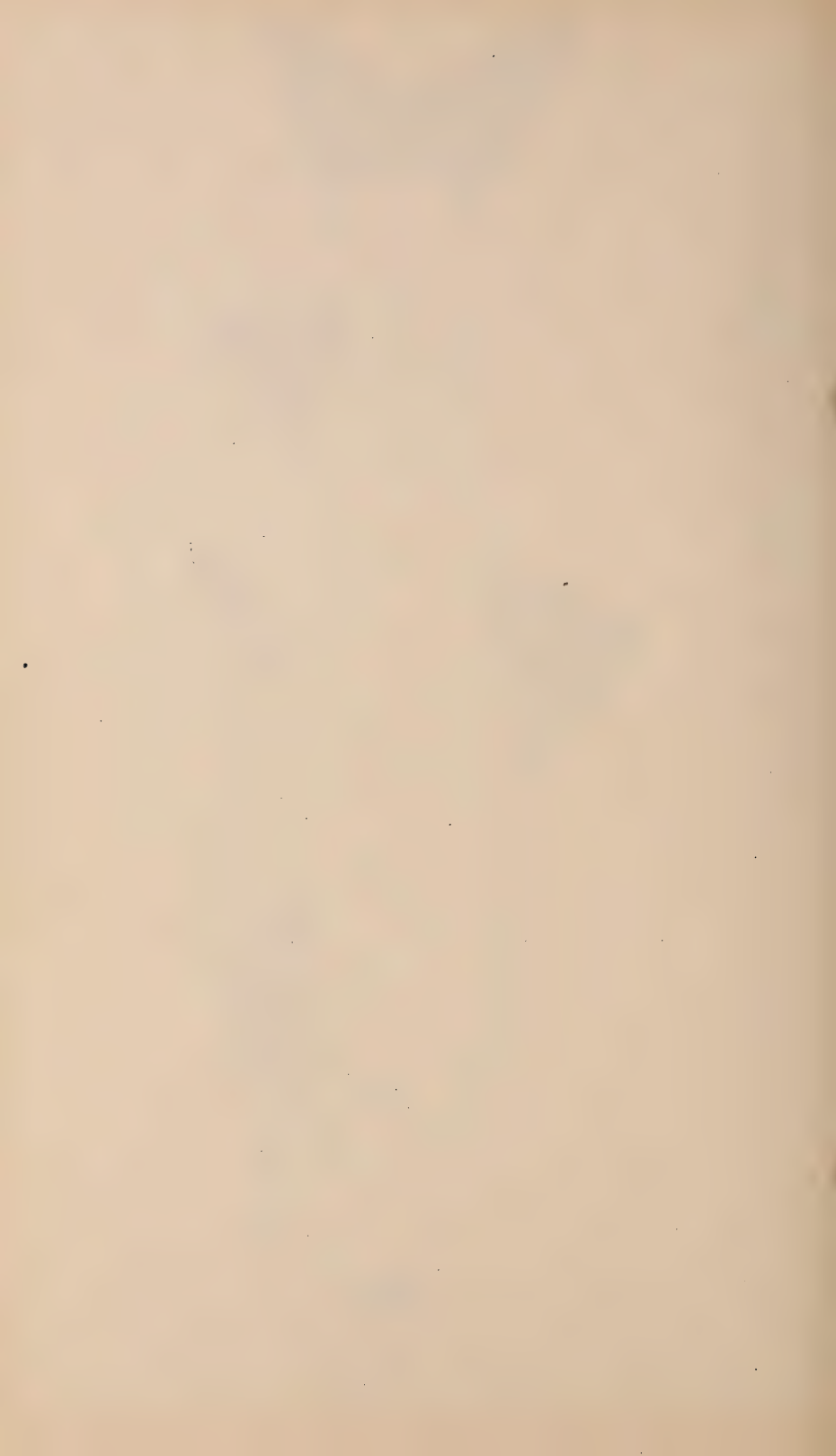


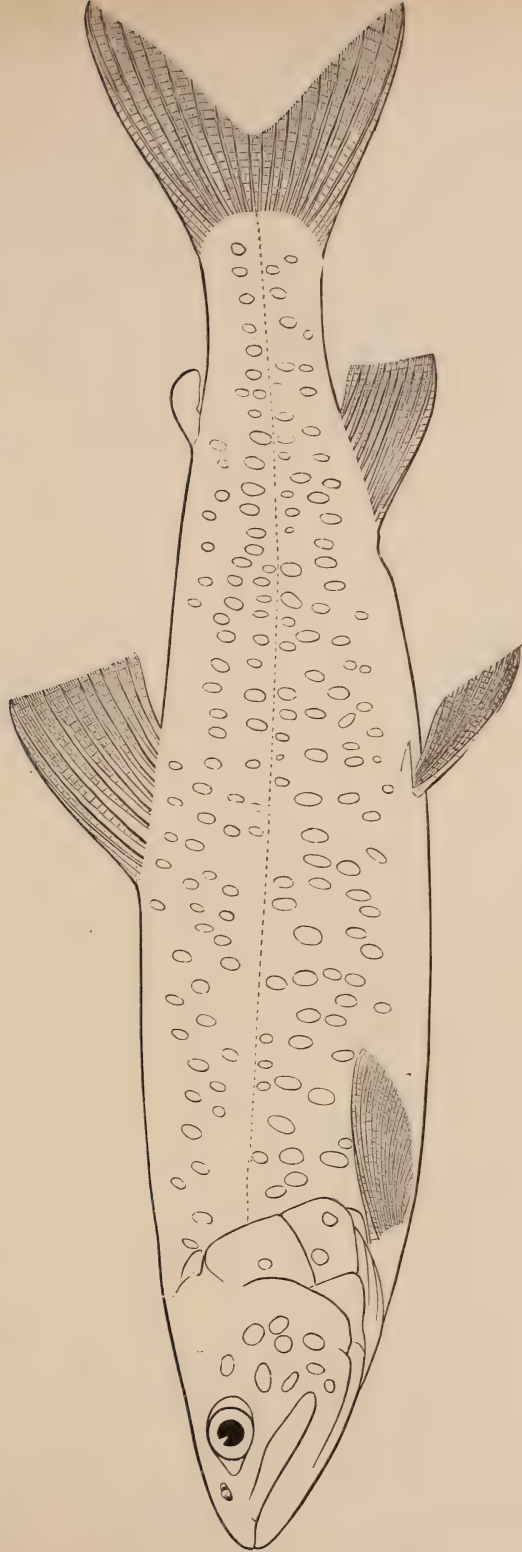
9. *Salmo lewisi*.



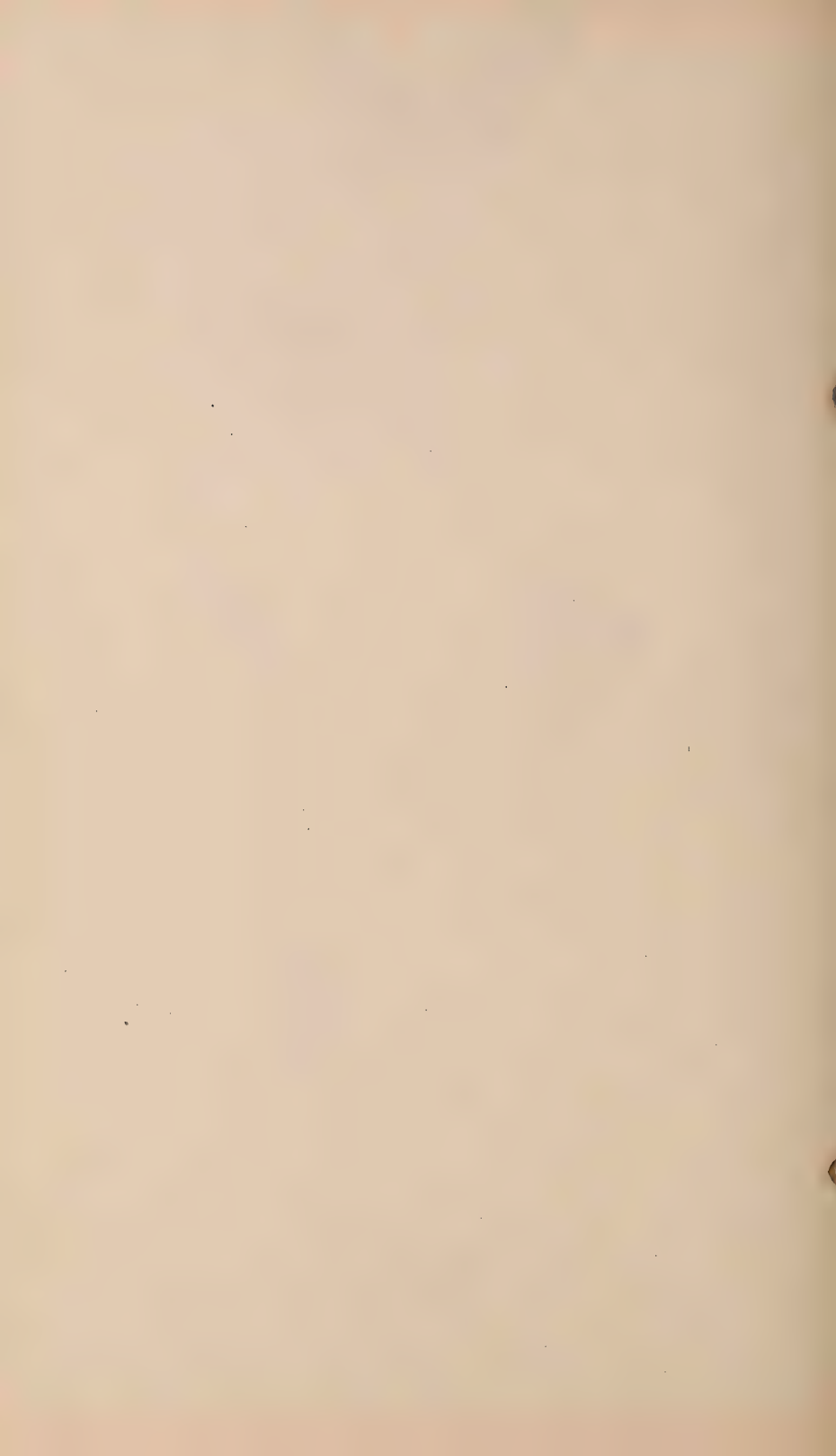


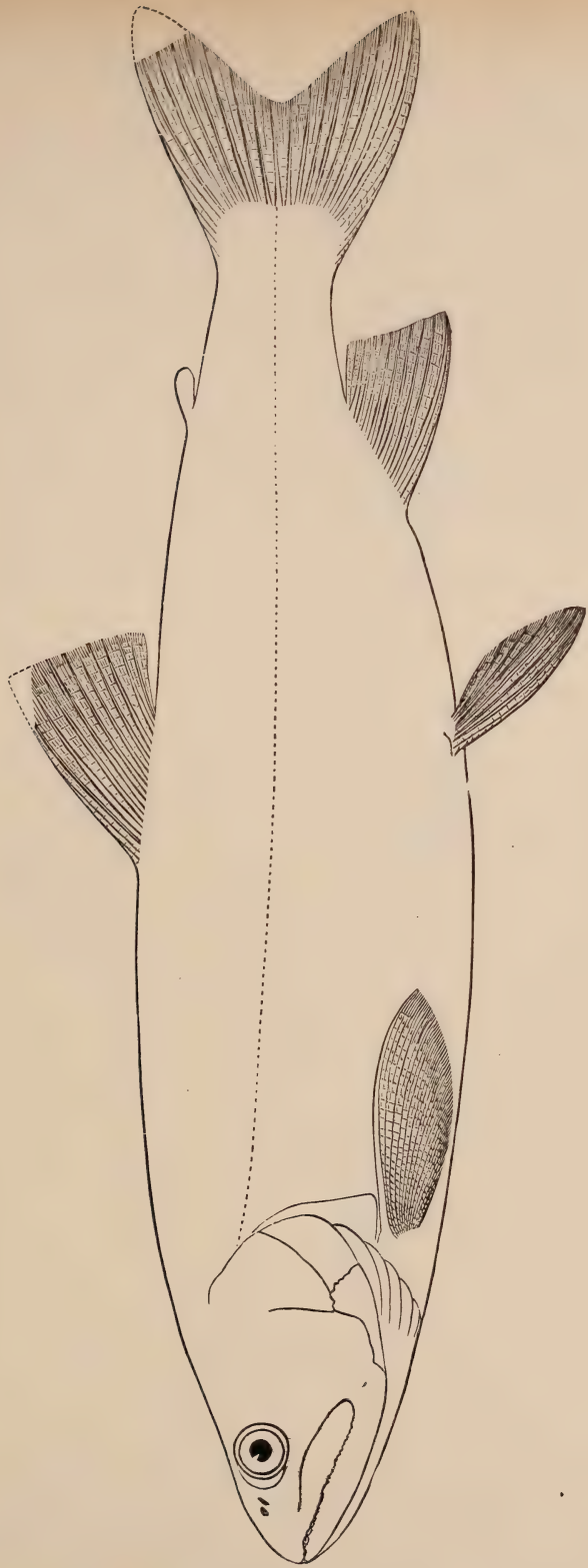
10. *Salmo namaycush*. Male.



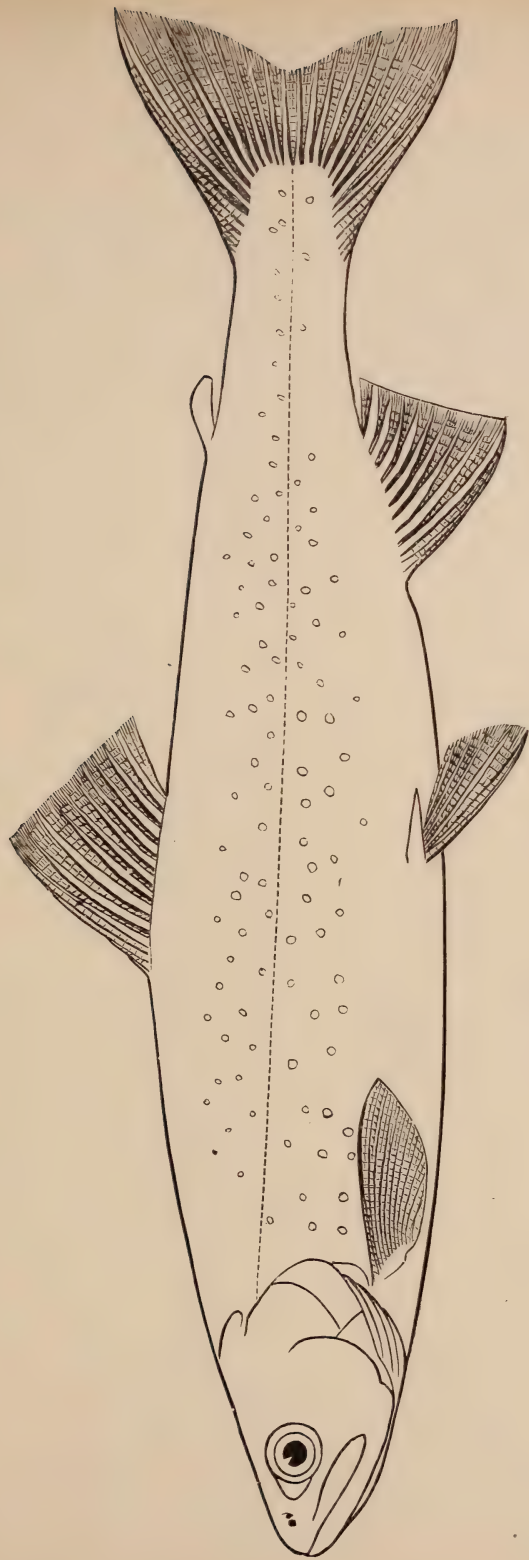


11. *Salmo namaycush*.

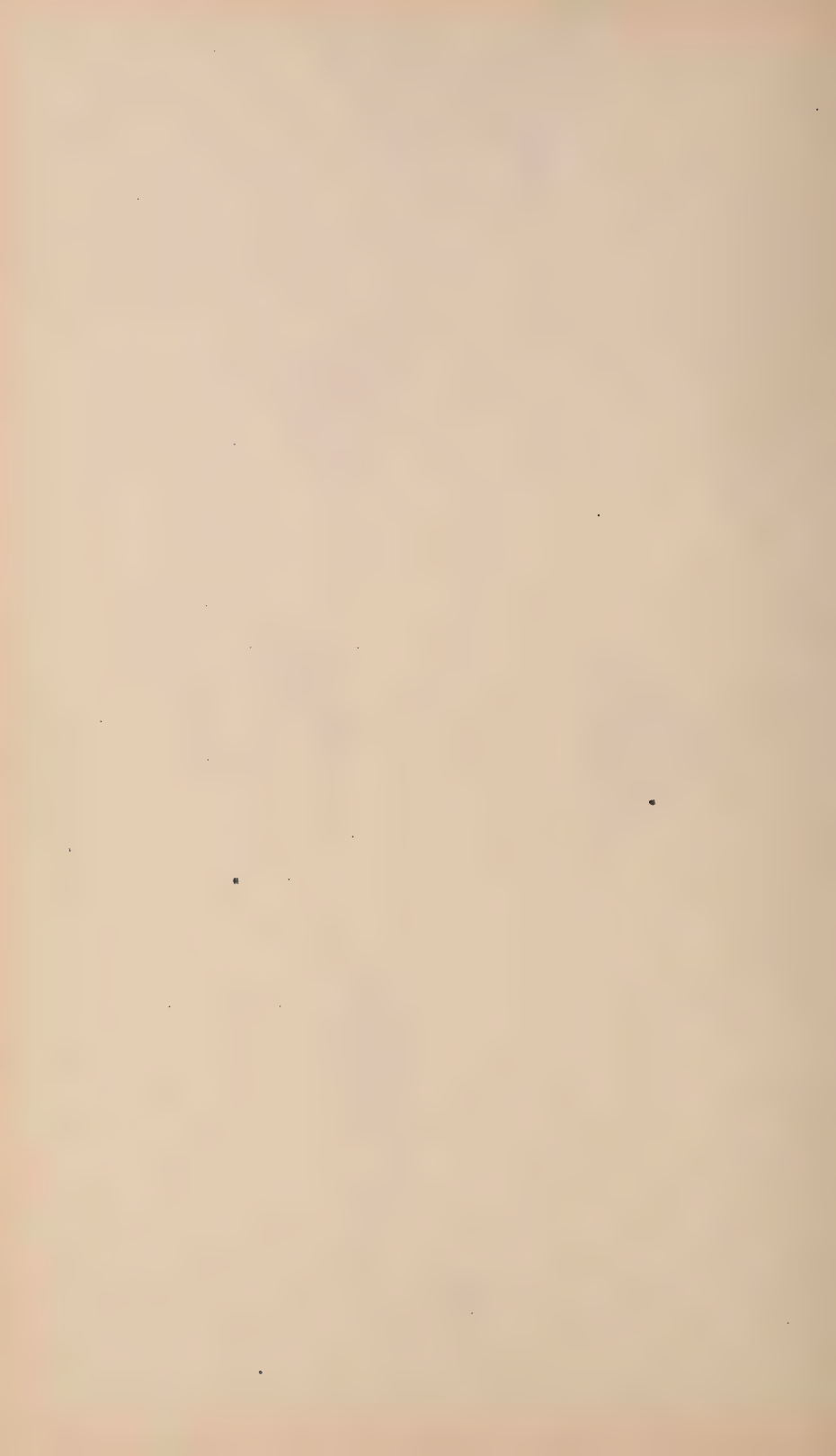


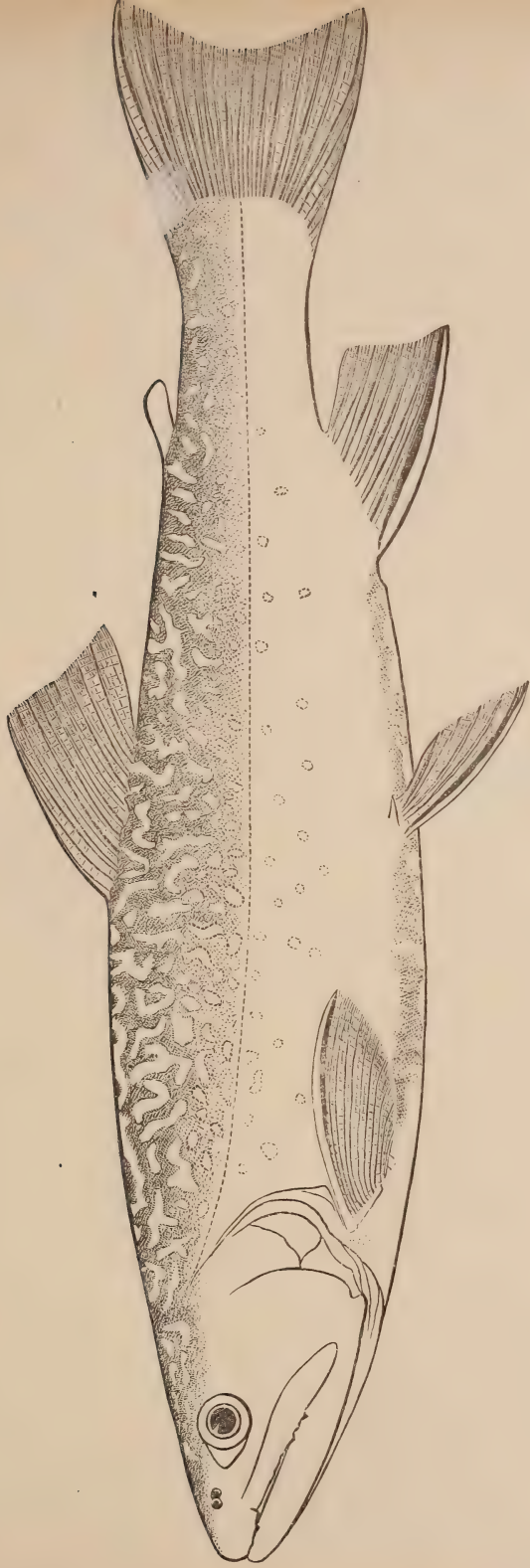


12. *Salmo siscowet*. Female.

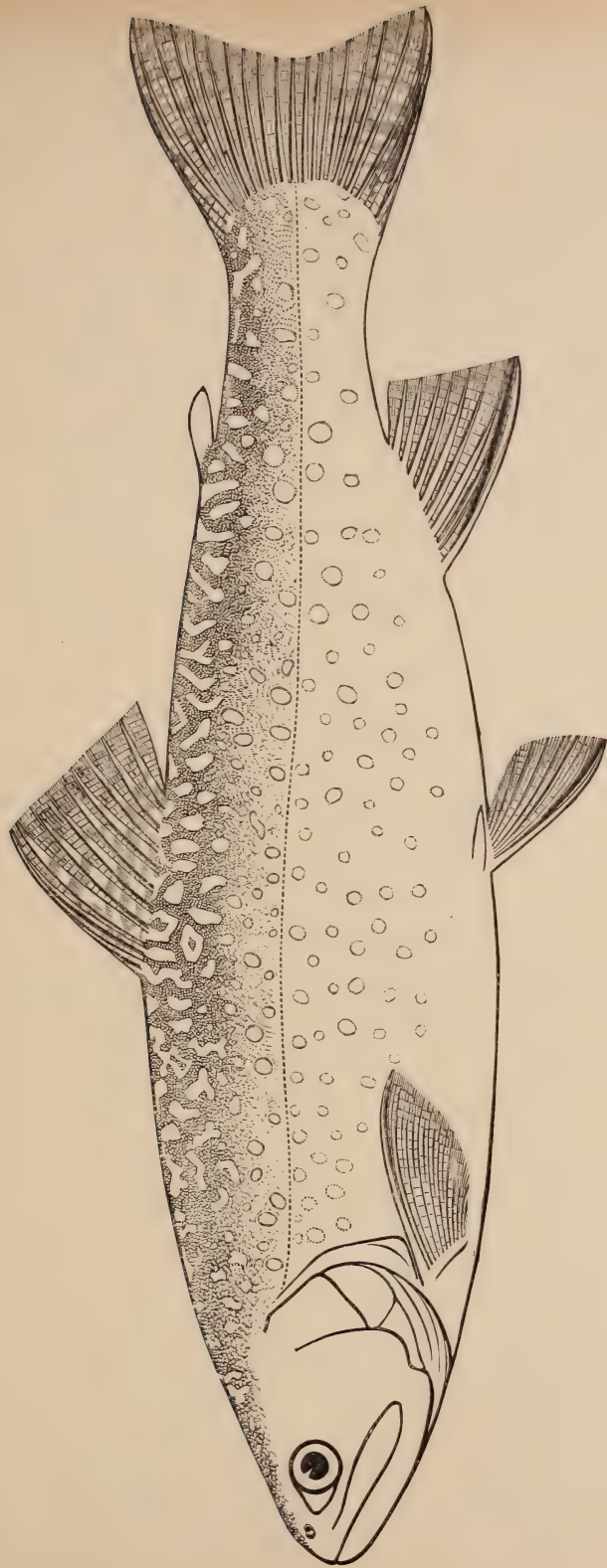


13. *Salmo oquassa*.

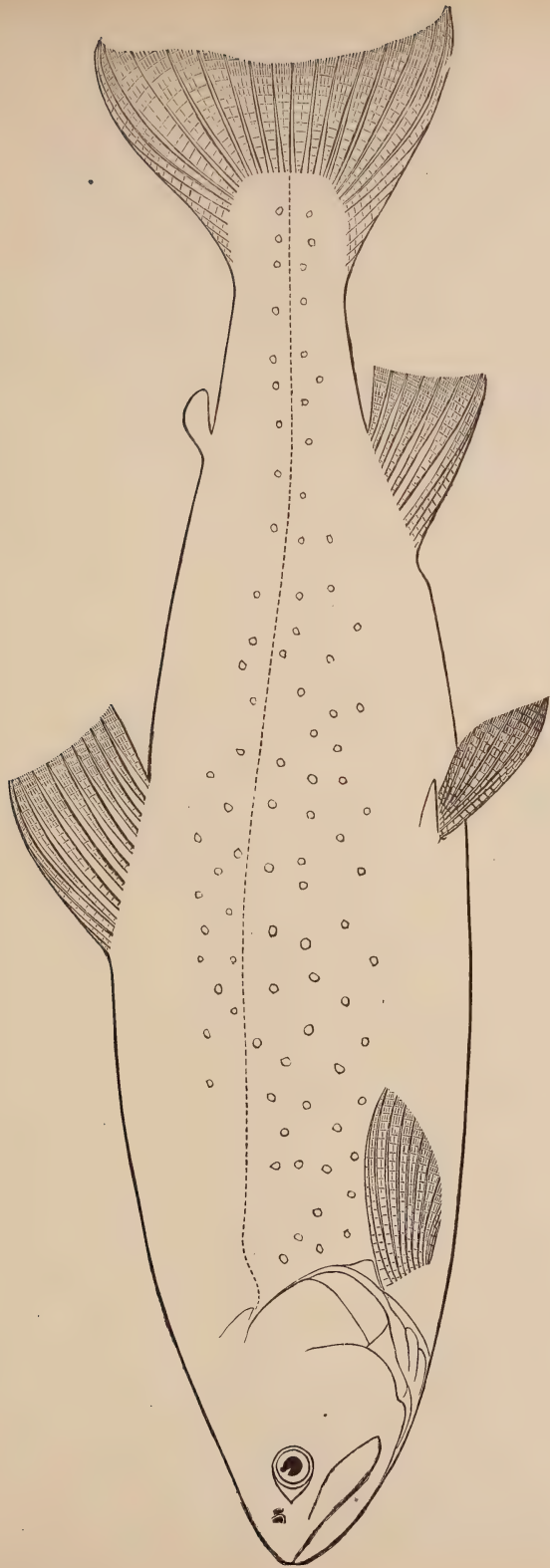




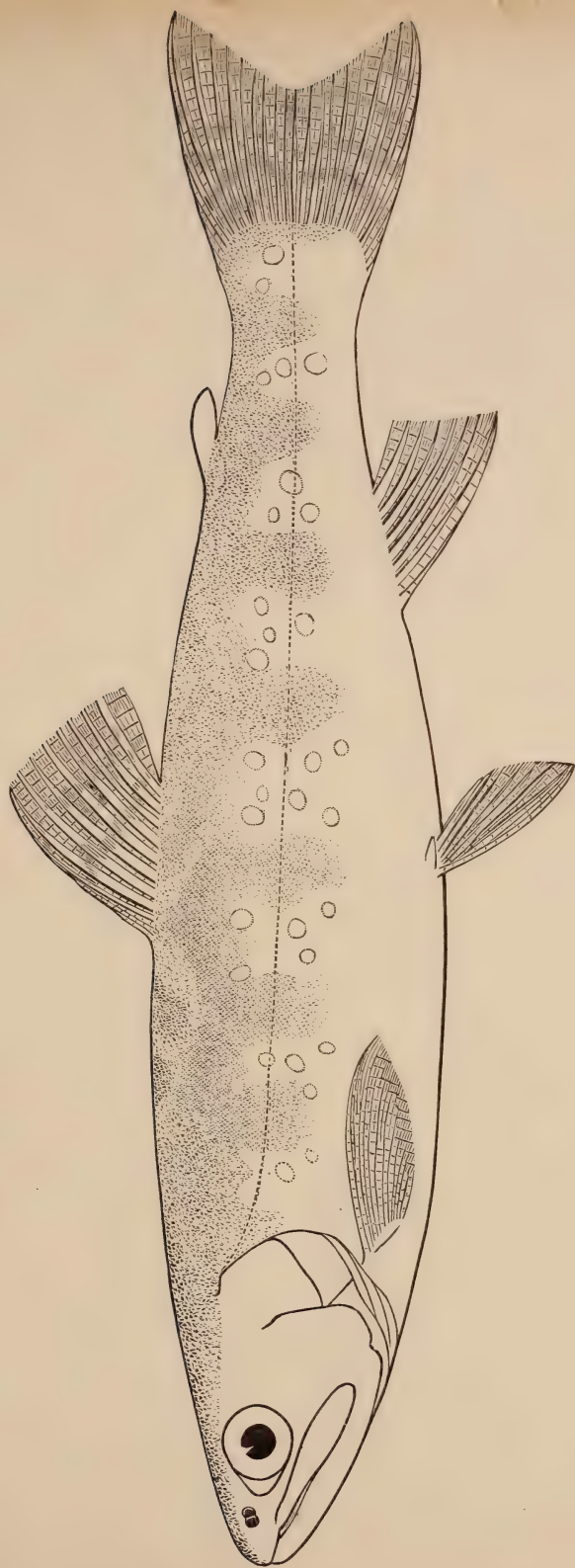
14. *Salmo fontinalis*. Male.



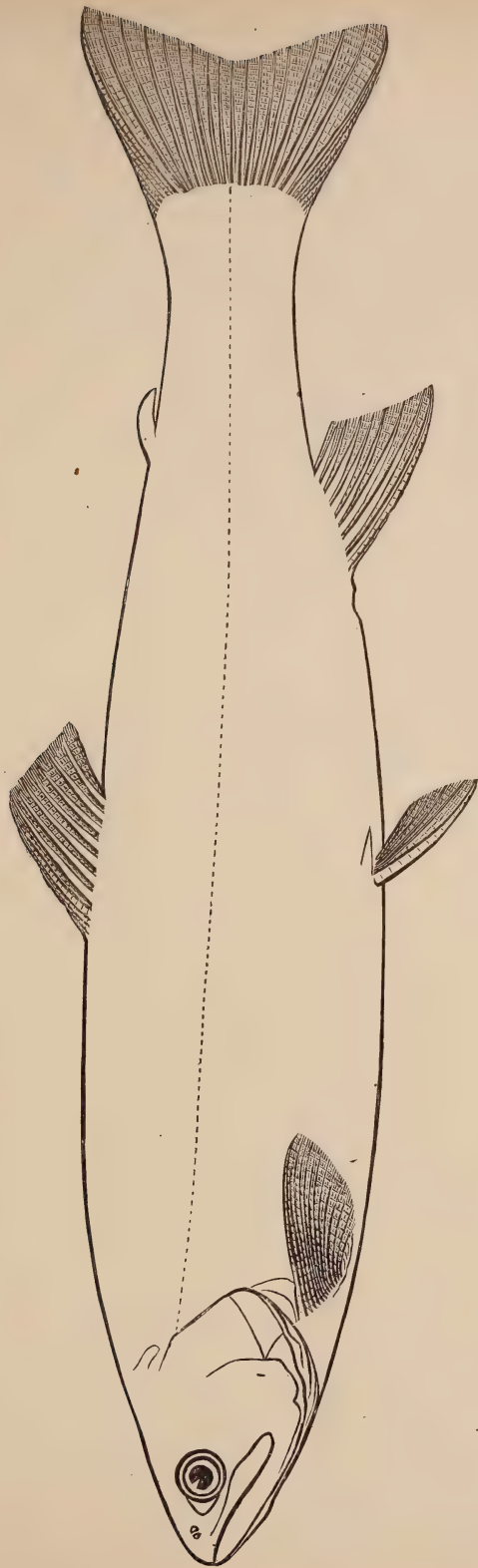
15. *Salmo fontinalis*. Female.



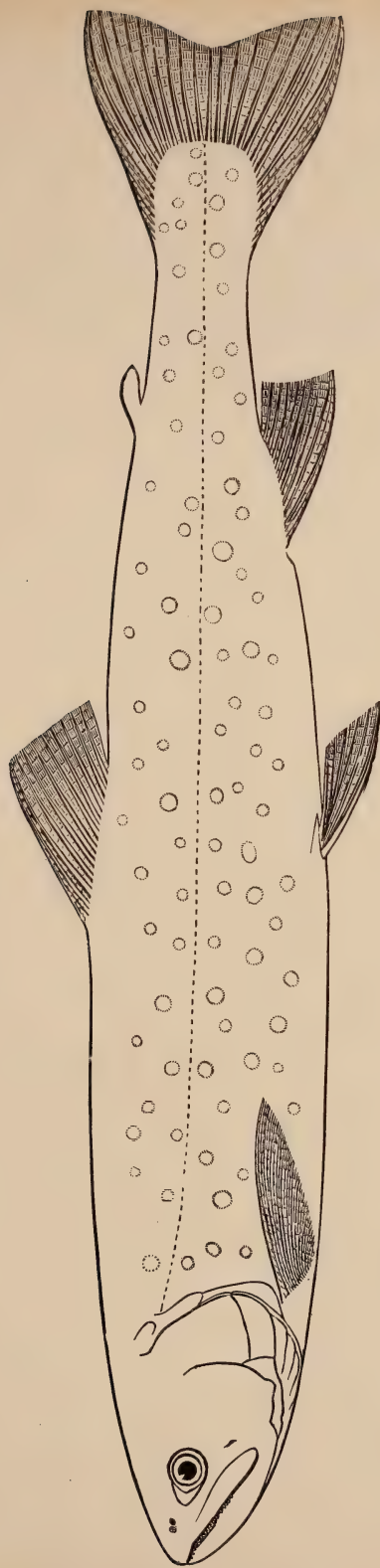
16. *Salmo fontinalis* var. *Female*.



17. *Salmo agassizii*. Young.



18. *Salmo agassizii*. Female.



19. *Salmo stagnalis*. Male.

the head very thin; opercles membranaceous. Only a very faint indication of striæ on the opercles. Three rays of dorsal behind the middle of the total length. Caudal peduncle long, slender; notch shallow.

Back brownish; sides silvery; belly reddish; flanks thickly sprinkled with light spots, orange or red in life. Specimen drawn, sixteen and a half inches in length, from Godthaab, Greenland.

[F.]

LAWS AND RESOLVES, 1884.

[CHAP. 171.]

AN ACT to limit the time within which Trout, Land-locked Salmon and Lake Trout may be taken.

Be it enacted, etc., as follows:

SECT. 1. The time within which any person is forbidden to take, sell, offer or expose for sale, or to have in his possession, a trout, land-locked salmon or lake trout, by sections fifty-one and fifty-three of chapter ninety-one of the Public Statutes, shall be between the first day of September and the first day of April.

SECT. 2. So much of said sections fifty-one and fifty-three as is inconsistent with this act is hereby repealed. [*Approved April 19, 1884.*]

[CHAP. 199.]

AN ACT in addition to an act to regulate the taking of Fish in North River in the county of Plymouth.

Be it enacted, etc., as follows:

SECT. 1. Whoever sets a seine or combination of seines over three hundred and eighty-five feet in length, or casts a mesh net over three hundred and fifty feet in length, in the North River in the county of Plymouth, shall for each offence be punished by fine not less than twenty-five nor more than one hundred dollars, or by imprisonment in the house of correction not less than one nor more than three months.

SECT. 2. Section forty-one of chapter ninety-one of the Public Statutes shall not apply to the fisheries in said North River.

SECT. 3. This act shall take effect upon its passage. [*Approved April 30, 1884.*]

[CHAP. 245.]

AN ACT concerning the Fisheries in waters of the county of Dukes County.

Be it enacted, etc., as follows:

SECT. 1. Section one of chapter one hundred and two of the acts of the year eighteen hundred and eighty-two is amended to read as follows: — Section 1. The lessees holding from the com-

missioners on inland fisheries a lease of any body of water in the county of Dukes County, and all other persons having the right to take alewives in any other waters in said county, may take alewives from said waters and from the ditches connecting them with each other and with the ocean at all seasons of the year and without restriction as to day.

SECT. 2. Section two of said chapter one hundred and two is amended to read as follows: — Section 2. Whoever other than said lessees or any other person duly authorized takes any fish, except eels, from any of said waters or ditches without the permission in writing of said lessees or said person duly authorized first obtained, shall forfeit one dollar for each fish so taken, and shall also forfeit any boat, net, line, rod or other apparatus used in such taking, in accordance with the provisions of chapter one hundred and ninety-four of the Public Statutes.

SECT. 3. This act shall take effect upon its passage. [*Approved May 20, 1884.*]

[CHAP. 317.]

AN ACT relative to Fishing in the Merrimack River.

Be it enacted, etc., as follows:

SECT. 1. Section one of chapter one hundred and sixty-six of the acts of the year eighteen hundred and eighty-two is hereby amended by inserting after the word “seine” and before the word “after” in the fourth line thereof, the following words: “with a mesh not less than two and a quarter inches.”

SECT. 2. This act shall take effect upon its passage. [*Approved June 3, 1884.*]

[CHAP. 264.]

AN ACT to protect the Fisheries of the towns of Mashpee and Barnstable.

Be it enacted, etc., as follows:

SECT. 1. No person not an inhabitant of the town of Mashpee shall fish for or take from the waters within said town, except Hamblin's Pond and its outlet, and excepting the trout fishery in Popponessett Bay, south of a line drawn from Gooseberry Island to Mashpee Neck, any fish, shell-fish or eels, without a written permit or lease from the selectmen of said town, stating the time, place, manner and number in which the same may be taken; nor shall any inhabitant of said town at any one time take more than three bushels of shell-fish for bait, or take any fish, shell-fish or eels for the purpose of selling the same, without a written permit from

said selectmen, who may grant the same for such sum, to be paid to the use of said town, as they shall deem proper: *provided, however*, that no seining shall be allowed in any of the waters of said town; but the inhabitants of said town may take such fish, shell-fish and eels for family use without such permit, except from such fisheries as are lawfully leased by said town to others.

SECT. 2. Whoever fishes for, takes or destroys any fish, shell-fish or eels in the waters of said town of Mashpee in violation of the provisions of this act, or otherwise than is specified in his permit, and whoever wilfully places any obstruction to, or otherwise interferes with, the free passage of fish or eels in said waters, shall for each offence be subject to a fine of not less than fifty nor more than one hundred dollars and costs of prosecution, and if he have a permit shall forfeit the same; and all fines under this act shall be paid, one-half to the town of Mashpee and one-half to the complainant. Said fine and forfeiture imposed under this act may be recovered by complaint before any trial justice, or by indictment before any court of competent jurisdiction in Barnstable County.

SECT. 3. Any constable or fishwarden of said town may, without a warrant, arrest any person whom he finds in the act of fishing for, taking or destroying fish, shell-fish or eels, in violation of this act, or in the act of carrying away fish, shell-fish or eels so taken, and detain him in some place of safe keeping until a warrant can be procured against such person upon a complaint for said offences, or either of them: *provided*, that such detention shall not exceed twenty-four hours.

SECT. 4. Section one of chapter thirty-five of the acts of the year eighteen hundred and fifty-two is hereby amended so as to read as follows: — No person shall set, draw or stretch any seine or drag-net in Barnstable Harbor, Osterville Harbor, Popponessett Bay, or any of the creeks, ponds or streams within the limits of the town of Barnstable, under a penalty of not less than fifty nor more than one hundred dollars, to be recovered in any court proper to try the same, one-half to the use of said town and the other half to any person who shall prosecute therefor.

SECT. 5. All acts and parts of acts inconsistent herewith are hereby repealed. [*Approved May 24, 1884.*]

[CHAP. 318.]

AN ACT to prevent the use of Nets in Ponds.

Be it enacted, etc., as follows:

SECT. 1. Whoever draws, sets, stretches or uses a drag net, set net, purse net or seine in any pond in the Commonwealth, or aids

in so doing, shall be punished by a fine of not less than twenty nor more than fifty dollars, one half of which shall be paid to the person making the complaint, and the other half to the county within which the offence was committed, and in addition shall forfeit to the Commonwealth all fish taken by the above means and the seines, boat and other apparatus used.

SECT. 2. Trial justices, police and district courts shall have jurisdiction to enforce the penalties provided in section one of this act.

SECT. 3. This act shall not be construed to interfere with the rights of lessees of great ponds in the counties of Barnstable, Dukes County and Nantucket, into which the usual varieties of salt water fish are or may be admitted by natural or artificial inlets, and which under existing leases have been seined or which may be leased with permission to seine the same, nor the riparian proprietors of ponds mentioned in section ten of chapter ninety-one of the Public Statutes, nor with the corporate rights of any fishing company. [*Approved June 3, 1884.*]

[G.]

LIST OF PONDS LEASED

*By the Commissioners on Inland Fisheries, under Authority given by Chap. 384, Sect. 9, of the Acts of 1869.**

1870.

- Feb. 1. Waushakum Pond, in Framingham, to Sturtevant and others, 20 years.
April 1. Mendon Pond, in Mendon, to Leonard T. Wilson and another, 20 years.
Sept. 12. Baptist Lake, in Newton, to J. F. C. Hyde and others, 20 years.
Oct. 15. Archer's Pond, in Wrentham, to William E. George, 15 years.

1871.

- Jan. 10. Nine-Mile Pond, in Wilbraham, to B. F. Bowles, 10 years.
30. Little Pond, in Falmouth, to F. H. Dimmick, 10 years.
April -. Spectacle, Triangle, and Peters ponds, in Sandwich, to G. L. Fessenden and another, 5 years.
17. Long Pond, in Falmouth, to Joshua S. Bowerman and three others, 20 years.
May 15. Pratt's Pond, in Upton, to D. W. Batcheller, 20 years.,
18. Little Sandy Pond, in Plymouth, to William E. Perkins 15 years.
Nov. 1. Punkapoag Pond, in Randolph and Canton, to Henry L. Pierce, 20 years.

* We would remind lessees of ponds that they are required, by their leases, to use all reasonable efforts to stock their ponds, and keep accurate records of the same, and make returns of their doings to the Commissioners on the 1st of October, each year, of the number and species of fish which they have put in or removed from their ponds. Any failure to comply with these conditions is a breach of contract invalidating their lease. It is important that the State should know just what is being done; and, where there appears to be mismanagement or apparent failure, the Commissioners will visit the ponds, and ascertain, if possible, the cause.

1872.

- Jan. 1. Sandy Pond, Forest Lake, or Flint's Pond, in Lincoln, to James L. Chapin and others, 20 years.
- July 20. Little Pond, in Braintree, to Eben Denton and others, 20 years.

1873.

- May 1. Meeting-house Pond, in Westminster, to inhabitants of Westminster, 15 years.
1. Great Pond, in Weymouth, to James L. Bates and others, 15 years.
- July 1. Little Sandy Pond, in Pembroke, to A. C. Brigham and others, 16 years.
- Sept. 1. Pontoosuc Lake, in Pittsfield and Lanesborough, to E. H. Kellogg and others, 15 years.
- Oct. 1. Farm Pond, in Sherborn, to inhabitants of Sherborn, 15 years.
1. Spot Pond, in Stoneham, to inhabitants of Stoneham, 15 years.
- Nov. 1. Lake Chaubunagungamong, or Big Pond, in Webster, to inhabitants of Webster, 5 years.
- Dec. 1. Lake Wauban, in Needham, to Hollis Hunnewell, 20 years.

1874.

- Mar. 1. Walden and White ponds, in Concord, to inhabitants of Concord, 15 years.
2. Upper Naumkeag Pond, in Ashburnham, to inhabitants of Ashburnham, 20 years.
- April 1. Elder's Pond, in Lakeville, to inhabitants of Lakeville, 15 years.
20. North and South Podunk ponds, in Brookfield, to inhabitants of Brookfield, 15 years.
- May 1. Maquan Pond, in Hanson, to the inhabitants of Hanson, 15 years.
2. Brown's Pond, in Peabody, to John L. Shorey, 15 years.
16. Wickaboag Pond, in West Brookfield, to Lemuel Fulham, 15 years.
20. Unchechewalom and Massapog ponds, to the inhabitants of Lunenburg, 20 years.
- July 1. Hardy's Pond, in Waltham, to H. E. Priest and others, 15 years.
1. Hockomocko Pond, in Westborough, to L. N. Fairbanks and others, 15 years.
11. Mitchell's Pond, in Boxford, to R. M. Cross and others, 15 years.

1874.

- July 11. Hazard's Pond, in Russell, to N. D. Parks and others, 20 years.
- Oct. 1. East Waushacum Pond, in Sterling, to inhabitants of Sterling, 20 years.
20. Middleton Pond, in Middleton, to inhabitants of Middleton, 15 years.

1875.

- Jan. 1. White and Goose ponds, in Chatham, to George W. Davis, 15 years.
- Mar. 1. Lake Pleasant, in Montague, to inhabitants of Montague, 10 years.
1. Hood's Pond, in Ipswich and Topsfield, to inhabitants of Topsfield, 15 years.
- April 1. Chauncey Pond, in Westborough, to inhabitants of Westborough, 15 years.
3. West's Pond, in Bolton, to J. D. Hurlburt and others, 15 years.
15. Gates Pond, in Berlin, to E. H. Hartshorn and others, 15 years.
24. Pleasant Pond, in Wenham, to inhabitants of Wenham, 15 years.
- May 1. Morse's Pond, in Needham, to Edmund M. Wood, 15 years.
1. Chilmark Pond, in Chilmark, to J. Nickerson and others, agents, 20 years.
- July 1. Winter Pond and Wedge Pond, in Winchester, to inhabitants of Winchester, 15 years.
1. Haggett's Pond, in Andover, to inhabitants of Andover, 20 years.
- Aug. 1. Oyster Pond, in Edgartown, to J. H. Smith and others, 20 years.
7. West Waushacum Pond, in Sterling, to inhabitants of Sterling, 20 years.
9. Mystic (Upper) Pond, in Winchester, Medford, and Arlington, to inhabitants of Winchester and Medford, 15 years.
- Oct. 1. Little Chauncey and Solomon ponds, in Northborough, to inhabitants of Northborough, 15 years.

1876.

- Feb. 1. Great Sandy Bottom Pond, in Pembroke, to Israel Thrasher and others, 15 years.
- Mar. 1. Dennis Pond, in Yarmouth, to inhabitants of Yarmouth, 15 years.

1876.

- Mar. 1. Crystal Lake, in Wakefield, to Lyman H. Tasker and others, 15 years.
20. Lower Naumkeag Pond, in Ashburnham, to inhabitants of Ashburnham, 18 years.
28. Dennison Lake, in Winchendon, to inhabitants of Winchendon, 15 years.
28. Phillipston Pond, in Phillipston, to inhabitants of Phillipston, 20 years.
- May 8. South-west Pond, in Athol, to Adin H. Smith and others, 15 years.
- June 1. Norwich Pond, in Huntington, to inhabitants of Huntington, 20 years.
10. Dug Pond, in Natick, to W. P. Bigelow and others, 15 years.
- Oct. 1. Farm and Learned's Pond, in Framingham, to inhabitants of Framingham, 15 years.
1. Whitney's Pond, in Wrentham, to inhabitants of Wrentham, 15 years.
1. Little Pond, in Barnstable, to George H. Davis, 15 years.

1877.

- Mar. 1. Nine-Mile Pond, in Wilbraham, to inhabitants of Wilbraham, 15 years.
15. Pentucket and Rock ponds, in Georgetown, to inhabitants of Georgetown, 15 years.
- Aug. 10. Onota Lake, in Pittsfield, to William H. Murray and others, 15 years.
- Oct. 1. Fort, Great Spectacle, and Little Spectacle ponds, in Lancaster, to inhabitants of Lancaster, 20 years.
1. Battacook Pond, in Groton, to George S. Graves and others, 15 years.
- Nov. 1. Tispaquin Pond, in Middleborough, to Abishai Miller, 15 years.

1878.

- Jan. 1. Sniptuit, Long, Snow, and Mary's ponds, in Rochester, to inhabitants of Rochester, 15 years.
- Mar. 16. Asnaconcomic Pond, in Hubbardston, to Amory Jewett, Jr., 15 years.
- April 1. Dorrity Pond, in Millbury, to inhabitants of Millbury, 10 years.
- May 1. Bear Hill Pond and Hall Pond, in Harvard, to inhabitants of Harvard, 15 years.
5. Spectacle, Peters, and Triangle ponds, in Sandwich, to George L. Fessenden, 10 years.

1874.

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20 years.
- Oct. 1. East Waushacum Pond, in Sterling, to inhabitants of
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Westborough, 15 years.
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15 years.
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15 years.
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habitants of Winchester, 15 years.
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dover, 20 years.
- Aug. 1. Oyster Pond, in Edgartown, to J. H. Smith and others,
20 years.
7. West Waushacum Pond, in Sterling, to inhabitants of
Sterling, 20 years.
9. Mystic (Upper) Pond, in Winchester, Medford, and
Arlington, to inhabitants of Winchester and Med-
ford, 15 years.
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- April 1. Dorrity Pond, in Millbury, to inhabitants of Millbury, 10 years.
- May 1. Bear Hill Pond and Hall Pond, in Harvard, to inhabitants of Harvard, 15 years.
5. Spectacle, Peters, and Triangle ponds, in Sandwich, to George L. Fessenden, 10 years.

1878.

- Oct. 1. Eel Pond, in Melrose, to J. A. Barrett and others, 15 years.
1. Accord Pond, in Hingham, South Scituate, and Rockland, to inhabitants of those towns, 10 years.
1. Wright's and Ashley's ponds, in Holyoke, to Henry C. Ewing and others, 10 years.
1. Magog Pond, in Acton and Middleton, to inhabitants of Acton, 15 years.

1879.

- Feb. 1. Lake Mahkunac and Lake Overie, in Stockbridge, to inhabitants of Stockbridge, 10 years.
July 1. Silver Lake, in Wilmington, to inhabitants of Wilmington, 10 years.
1. Fresh Pond, in Falmouth, to Thomas H. Lawrence, 20 years.
Oct. 1. Pomp's Pond, in Andover, to inhabitants of Andover, 15 years.
Nov. 1. Lake Quinapowitt, in Wakefield, to inhabitants of Wakefield, 14 years.

1880.

- Mar. 1. Lake Winthrop, in Holliston, to inhabitants of Holliston, 15 years.
15. Massapoag Pond, in Sharon, to inhabitants of Sharon, 10 years.
May 1. Tisbury Great Pond, in Tisbury, to Allen Look and others, 10 years.
June 1. Indian Pond, in Kingston, to inhabitants of Kingston, 10 years.
1. Jordan Pond, in Shrewsbury, to inhabitants of Shrewsbury, 15 years.
July 1. Swan and Martin's ponds, in North Reading, to inhabitants of North Reading, 15 years.
Sept. 1. Herring Pond, in Eastham, to William H. Nickerson, 10 years.
Dec. 24. Chadwick's Pond, in Bradford and Boxford, to town of Bradford, 10 years.

1881.

- Jan. 1. Great and Job's Neck ponds, in Edgartown, to Amos Smith and others, 15 years.
Mar. 1. The Mill Ponds (three), in Brewster, to Valentine B. Newcomb and another, 15 years.
April 1. Long Pond, in Blandford, to Samuel A. Bartholomew and another, 15 years.
May 2. Nonesuch Pond, in Weston and Natick, to W. A. Bulard and others, 15 years.

1882.

- Mar. 1. Blair's Pond, in Blandford, to Curtis M. Blair and another, 15 years.
- April 1. Ward Pond, *alias* Wightman Pond, in Ashburnham, to Herbert F. Rockwood and another, 15 years.
- May 1. Horn Pond, in Woburn, to inhabitants of Woburn, 15 years.
- June 1. Wickaboag Pond, in West Brookfield, to inhabitants of West Brookfield, 15 years.
- Oct. 1. Long and Hummock ponds, in Nantucket, to Charles E. Snow and others, 15 years.

1883.

- Mar. 1. Halfway Pond, in Plymouth, taken by Commissioners for 5 years, in accordance with provisions of Chap. 62, Acts of 1876.
- April 6. Fresh Pond, in Tisbury, to Allen Look and others, 15 years.
23. Keyes Pond, in Westford, to M. H. A. Evans, 15 years.
- May 7. Singletary Pond, in Sutton and Millbury, to towns of Sutton and Millbury, 15 years.
7. The Great Pond, in Ashfield, to town of Ashfield, 15 years.
- July 1. Lake Buell, in Monterey and New Marlborough, to town of New Marlborough, 10 years.

1884.

- June 1. Bald Pate, Four-Mile, and Stiles ponds, in Boxford, to inhabitants of Boxford, 10 years.
- July 15. Asneybunskeit Pond, in Paxton, to inhabitants of Paxton, 10 years.
15. Center Pond, in Dennis, to inhabitants of Becket, 10 years.
15. Buckmaster Pond, in Dedham, to Francis Soule and others, 10 years.
15. Fresh Pond, in Dennis, to inhabitants of Dennis, 10 years.
17. Farm Pond, in Cottage City, to John C. Hamblin and others, 15 years.
18. Mashpee, Great, and Wakeley ponds, in Mashpee, to inhabitants of Mashpee, 10 years.
- Aug. 30. Sand Pond, in Ayer, to inhabitants of Ayer, 15 years.
- Sept. 5. Great Pond, in North Andover, to inhabitants of North Andover, 15 years.

[H.]

TABLES SHOWING

RETURNS OF WEIRS, SEINES AND GILL-NETS.

TABLE NO. I. — POUNDS AND WEIRS. — Showing the Catch of each during 1884.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Spanish Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fish.	Eels.	Other Edible Fish.
Manchester,	John G. Heath,	93	2,880	124,720	-	72	35	-	84,026	-	-	5	57	-	1
"	Jones Bros.,	-	-	173,250	-	-	-	-	77,825	-	-	-	-	-	-
"	Jones & West,	-	90	107,136	-	-	-	-	23,851	-	-	-	-	-	67
Hingham,	Thomas Weston,	-	1,150	-	-	-	-	-	-	-	-	-	-	18,700	-
Sandwich,	T. L. Mayo and others,	-	-	30,800	-	-	-	-	110,860	-	4,820	103	-	-	11
Barnstable,	W. F. Carney and others,	118	1,263	415	294	-	58,611	64	2	-	120	5	8	-	-
Dennis,	Crowell Weir Co.,	-	-	6	-	-	-	12,050	25,215	-	94	62	-	-	-
"	Deep Water Weir Co.,	-	-	-	-	-	-	-	49,910	-	27	216	-	-	-
"	East Dennis Weir Co.,	6	1,000	-	-	-	-	-	14,095	-	17	-	-	-	2,972
"	Nobscussett Fish Weir Co.,	6	1	-	-	1,027	-	-	4,189	-	777	20	1	-	-
"	Sears Bros.,	6	3,475	50	-	-	22	-	23,415	-	8	13	29	-	-
Brewster,	Freeman Atwood & Son,	6	125	-	-	5	-	-	22,070	-	1,176	460	56	-	-
"	Brewster Fish Weir Co.,	1	1,408	-	-	-	-	-	25,100	-	-	52	-	-	-
"	James Eldredge,	-	500	-	-	18	-	-	5,600	-	219	-	-	-	-
"	Ellis & Cahoon,	-	-	-	-	-	-	-	1,470	-	440	12	-	-	-
"	J. H. Newcomb & Co.,	117	2,835	-	640	-	-	-	16,205	-	55	47	36	-	-
"	Parker & Ellis,	1	-	500	1	12	-	-	403	-	19	37	-	-	-

East Brewster,	Z. H. Rogers,
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"	Charles C. Church,	.	.	5	-	1,181	-	118,513	1,061	14	-	35	-	717	1	6,169
"	Peter B. Davis,	.	.	-	-	-	-	43,500	303	-	-	-	-	-	-	5,150
"	L. A. Edwards,	.	.	3	1,255	26	1,074	192	1,415	4	-	125	596	3,976	3	2,193
"	Akin & Manley,	.	.	-	-	-	-	-	96,300	-	-	100	-	-	1,900	100
"	C. C. Murphy,	.	.	-	1,750	-	-	2	26,095	591	-	38	17	7,221	-	-
"	A. B. Veeder & Co.,	.	.	-	2,320	-	-	-	94,900	514	-	748	256	9,314	-	-
"	F. A. Veeder,	.	.	10	701	-	1,260	-	29,287	179	-	447	390	7,229	-	-
Fairhaven,	J. C. & J. J. Allen,	.	.	3	3,460	-	-	-	21,272	73	-	13	729	314	9	-
"	W. H. Bryant,	.	.	6	418	3,120	-	55	6,600	79	-	14	1,377	2,060	9	-
"	Daniel W. Deane No. 1,	.	.	6	15,981	-	4,119	123	33,534	371	-	3	1,710	1,572	132	23,830
"	Daniel W. Deane No. 2,	.	.	4	14,919	1,500	4,806	204	6,537	231	8	8	2,510	4,564	182	6,325
"	George R. Deane,	.	.	1	10,754	-	1,422	70	47,118	145	5	208	1,569	2,630	46	-
"	Samuel P. Dunn,	.	.	-	23,904	-	1,538	331	53,509	304	-	87	3,200	2,830	-	-
"	George L. Hiller,	.	.	5	15,120	-	-	52	49,751	673	1	37	1,841	4,169	-	-
"	Matthew Merry,	.	.	-	11,785	-	1,660	16	2,601	159	-	37	27	203	16	-
"	Ebenezer Mott,	.	.	5	9	-	2,533	28	2,992	130	-	29	882	768	14	-
"	C. H. Pease & Co.,	.	.	4	19,330	-	214	28	21,924	115	1	146	460	2,346	2	3
"	R. W. Pease,	.	.	6	6,271	10,100	1,020	218	13,645	207	-	102	-	1,320	-	-
"	D. C. Potter,	.	.	2	31,055	7	3,083	61	6,897	777	-	45	565	2,799	77	576
"	C. D. Sherman,	.	.	-	3,744	-	4,468	176	2,920	1,571	-	116	629	3,563	32	137
"	George R. Wixon,	.	.	5	21,182	-	3,389	37	5,246	211	-	185	188	537	133	-
"	George R. Wixon & Co.,	.	.	19	10,715	-	1,250	227	12,391	428	-	236	1,090	1,340	167	71

TABLE NO. I. — POUNDS AND WEIRS — Concluded.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Spanish Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fish.	Eels.	Other Edible Fish.
Dartmouth, .	Joseph F. Briggs, .	89	-	327	3,086	768	4,667	818	8	-	380	245	2,569	-	13
"	William E. Butts, .	24	7,302	-	2,579	88	13,095	1,560	-	-	39	294	5,331	-	-
"	F. B. Manchester & Co.,	198	40,772	60	21,700	1,323	7,482	1,341	-	-	253	-	2,417	-	-
"	George Prialux, .	-	9,756	268	5,467	24	15,523	1,153	-	-	81	1,101	4,371	7	860
"	Benjamin Queripel, .	141	10,621	2,697	32,667	33	26,334	1,010	-	-	23	2,709	3,790	-	-
"	George A. Snell, .	298	48,585	-	-	204	94,945	7,250	-	2	267	-	12,141	-	96
"	Snell & Crapo, .	44	11,547	10	2,005	189	576	2,181	5	-	682	528	4,793	-	67
"	Jonas Travers, .	49	-	7,615	-	11	8,189	10,731	2	-	131	139	3,278	-	-
"	Waite & Smith, .	128	19,784	-	168,320	1,096	30,841	9,149	9	-	1,840	369	17,129	2	-
South Dartmouth, .	Nicholas Prialux, .	46	5,174	6,655	-	18	4,335	587	-	-	157	284	4,654	76	-
Chilmark, .	Richard Flanders & Co.,	-	-	-	-	-	64,100	1,880	-	-	67	-	1,316	-	2,225
"	H. O. Poole & Co., .	10	2,950	-	600	1	65,207	1,098	29	-	245	51	12,886	-	-
Tisbury, .	C. F. Cleveland, .	-	3,970	-	2,824	-	3,810	483	150	-	11	162	3,536	888	-
"	E. S. W. D. Cleveland, .	2	540	3,647	36	-	1,129	778	-	-	1	-	6,087	-	-
"	Obed S. Daggett, .	-	1,739	-	-	25	43,847	920	552	-	844	82	1,087	-	932
	Total,	5,392	715,886	2,806,203	308,381	6,950	1,641,129	74,826	1,440,486	99	109,694	28,929	288,930	33,980	84,372

TABLE NO. II.—SALT-WATER SEINES—Showing the Catch of each during 1884.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alwives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Spanish Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fish.	Eels.	Other Edible Fish.
Newburyport, .	Charles Caswell, .	2,138	15,200	-	-	1	-	-	-	-	-	-	-	47	-
"	John Janvin, .	1,071	-	74,100	-	-	-	-	-	-	-	-	-	-	-
"	W. H. H. Perkins, .	2,025	-	-	-	-	-	-	-	-	-	-	-	-	-
"	Ezra Thurlow, .	1,167	-	416,400	-	-	-	-	3,000	-	4	-	-	640	-
Sandwich, .	George F. Hozie, .	-	-	-	-	65	-	-	-	-	-	503	-	-	-
Barnstable, .	James A. Fish, .	-	-	-	-	-	3,264	-	-	-	681	-	-	-	647
"	Henry C. Lumbert, .	-	-	-	-	-	72	-	-	-	4,959	-	-	7	-
Centreville, .	Z. D. Bearse, .	-	-	-	-	-	-	-	-	-	1,156	-	-	-	-
"	William E. Bearse, .	-	-	-	-	114	310	-	-	-	2,176	-	-	-	-
Yarmouth, .	D. S. Baker, .	-	2,665	-	-	-	-	-	-	-	-	-	-	-	-
West Dennis, .	Sylvester Baker, .	-	1,697	-	-	-	-	-	-	-	-	-	-	-	-
Truro, .	Dolby & Loring, .	-	-	-	-	-	-	-	-	-	89	-	-	-	-
Orleans, .	John M. Smith, .	-	-	-	-	-	-	-	-	-	6,712	-	-	-	-
Chatham, .	Horatio Howes, .	-	-	721	-	-	-	-	-	-	-	-	-	-	-
Hyannisport, .	B. F. Lumbert, .	-	-	-	-	-	-	-	-	-	3,517	-	-	-	-
Westport, .	Samuel G. Allen, .	-	13,055	15	16	53	-	1	-	-	-	1	2	36	843

TABLE II. — SALT-WATER SEINES — Concluded.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Spanish Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fish.	Eels.	Other Edible Fish.
Westport, . . .	Theodore Pierce, . . .	-	5,016	-	-	52	-	3	-	-	-	-	31	405	-
" . . .	Perry G. Potter, . . .	-	10,978	-	1,323	26	-	-	-	-	-	-	-	-	-
South Westport, . . .	Leonard M. Sanford, . . .	2	3,515	-	-	29	-	-	-	-	-	-	-	575	-
" . . .	Charles A. Tripp, . . .	20	3,447	-	4	8	-	-	-	-	-	115	-	364	-
South Dartmouth, . . .	John Mendreus, . . .	107	-	11,373	-	227	2,016	1,328	2	6	61	280	2,683	-	-
Nantucket, . . .	Charles E. Snow, . . .	-	3,334	-	-	-	-	4	-	-	689	-	-	-	16,308
	Total, . . .	6,530	58,907	502,609	1,343	575	5,662	1,336	3,002	6	20,044	899	2,716	2,074	17,798

TABLE No. III. — GILL-NETS. — Showing the Catch of each during 1884.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fish.	Eels.	Other Edible Fish.
Barnstable,	S. H. Crawford,	.	.	.	.	.	84	.	.	366	.	.	.	.
"	H. F. Kelley,	.	.	.	.	.	.	.	.	2,010	.	.	.	.
"	J. D. Kelley,	.	.	.	.	.	.	.	.	1,187	.	.	.	.
Centreville,	W. H. Hallett,	.	.	.	.	.	.	.	.	1,501	.	.	.	.
"	B. W. Lewis,	.	.	.	.	.	.	.	.	503	473	.	.	.
Cotuit,	David Rogers,	.	.	.	.	.	.	.	.	4,063	.	.	.	.
Dennis,	Zenas H. Baker,	.	.	1	3	5	1	.	.	1,792	.	21	57	49
"	Venez Kelley,	.	.	.	.	.	.	.	.	252	.	.	.	.
"	Joshua Pierce,	.	.	.	.	.	.	.	.	1,543	.	.	.	.
Wellfleet,	W. F. Pierce,	.	.	30,000	.	.	.	.	55,608	10,238	.	.	.	.
Truro,	Benjamin Coan,	.	.	.	.	.	.	.	2,020	486	.	.	.	.
"	E. P. Worthen,	.	.	.	.	.	.	.	1,433	.	.	.	.	.
North Truro,	R. S. Chandler,	.	.	.	.	.	.	.	500	125	.	.	.	.
"	Caleb M. Grozier,	.	.	.	.	.	.	.	1,214	372	.	.	.	.
Provincetown,	James F. Atkins,	.	.	.	.	.	.	.	7,764	629	.	5,000	.	.
"	Paul L. Bangs,	.	.	.	1	.	.	.	1,280	913	.	.	.	.
"	Nathaniel N. Cook,	.	.	.	.	.	.	.	.	2,052	.	.	.	.

TABLE No. III. — GILL-NETS — Continued.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fish.	Belts.	Other Fish.
Provincetown,	Manuel Frances,	.	.	.	.	.	.	.	6,771	1,422	.	.	.	.
"	John Freeman,	.	.	.	.	.	.	.	-	155	.	.	.	.
"	George W. Freeman,	.	.	.	.	.	.	.	193	332	.	.	.	.
"	S. H. Ghen & R. Atkins,	.	.	.	.	.	.	.	-	2,066	.	.	.	.
"	J. C. P. Harvender,	.	1,518	7,392	.	.	.	.	35,330	-	.	.	.	.
"	Levi B. Kelley,	.	.	.	.	.	.	.	2,878	711	.	.	.	.
"	George Lewis,	.	.	.	.	.	.	.	9,813	2,498	.	3,570	.	.
"	Jonathan H. Little,	.	.	.	.	.	.	.	-	208	.	.	.	.
"	Joseph Mayo,	.	.	.	.	.	.	.	21,126	3,914	.	.	.	.
"	Thomas Mayo,	.	.	688	.	.	.	.	558	-	.	.	.	.
"	James G. Rand,	.	.	.	.	.	.	1,075	16,779	8,742	.	.	.	.
"	Reuben Ryder,	.	.	.	.	.	.	.	2,013	1,601	.	7,700	.	.
"	Edwin Sears,	.	.	400	.	.	.	.	7,744	-	.	.	.	.
"	Joseph Sears,	.	.	250	.	.	1	.	9,451	2,344	.	.	.	.
"	Lot Small,	.	.	.	.	.	.	.	103	102	.	.	.	.
"	H. N. Smith,	.	.	.	.	.	.	138	2,552	-	.	.	.	.
"	Reuben Swift,	.	.	.	.	.	.	.	1,835	1,481	.	.	.	.

[illegible]

TABLE No. III. — GILL-NETS — Concluded.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fish.	Eels.	Other Fish.
Nantucket, .	A. H. Adams,	.	.	.	.	.	.	.	.	2,251	.	.	.	.
"	Horace B. Cash,	.	.	.	.	.	25	.	.	2,106	.	1	.	.
"	Isaac P. Dunham,	.	.	.	.	.	.	.	.	4,535	.	.	.	.
"	W. I. Fisher,	.	.	.	.	.	.	.	.	2,681	.	.	.	.
"	J. O. Freeman,	.	.	.	.	.	.	.	.	2,016	28	.	.	.
"	R. W. Paine & Co.,	.	.	.	.	.	10	5	.	1,407	.	.	.	.
"	Warren F. Ramsdell,	.	.	.	.	.	.	56	.	3,192	92	.	.	.
	Total,	14	8,405	39,080	183	57	2,193	1,918	213,827	116,024	679	16,325	352	231

TABLE NO. IV. — CONNECTICUT RIVER SEINES.

TOWN OR PLACE.	PROPRIETOR.	Shad.
South Hadley,	C. C. Smith and others,	1,539
Agawam,	A. Converse,	54
	Total,	1,593

TABLE NO. V. — MERRIMAC RIVER SEINES.

TOWN OR PLACE.	PROPRIETOR.	Shad.
North Andover,	Eben Sutton,	14
West Newbury,	Jonathan Morrill,	97
	Total,	111

TABLE NO. VI. — TAUNTON RIVER SEINES.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Striped Bass.
Raynham,	J. S. Townsend & Bros.,	302	114,100	-
"	G. B. & E. Williams,	574	127,369	-
Taunton,	John W. Hart & Co.,	237	59,800	-
Dighton,	O. M. & E. Buffington,	400	75,000	-
"	Edmund Hathaway,	695	121,076	429
"	Charles N. Simmons,	600	140,000	-
Berkley,	Isaac N. Babbitt,	229	66,315	-
"	Nichols & Shove,	600	164,000	-
"	W. H. Walker,	400	72,000	-
Somerset,	George H. Simmons,	-	20,076	-
	Total,	4,037	959,736	429

TABLE NO. VII.—OTHER FRESH-WATER SEINES AND DIP-NET FISHERIES.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Striped Bass.	Frostfish.
Medford, . . .	Cross Bros.,	-	163,810	-	-
Weymouth, . . .	Weymouth Iron Co.,	-	68,750	-	-
Plymouth, . . .	W. S. Hadaway,	-	-	-	15,000
" . . .	B. F. Hodges,*	7	18,287	-	-
" . . .	Town Brook,	-	44,020	-	-
Yarmouth, . . .	Long Pond Fishing Co.,	-	9,630	-	-
Brewster, . . .	Winslow & Newcomb,	-	130,388	-	-
Wellfleet, . . .	Herring Brook,	-	130,415	-	-
Mashpee, . . .	M. Amos,	-	2,866	-	-
" . . .	David Lovell,	13	8,148	733	-
" . . .	W. R. Mingo,	-	25,465	-	-
Westport, . . .	Lysander W. White,	-	4,155	6	-
South Westport, .	Philip S. Tripp,	2	4,913	58	-
	Total,	22	610,847	897	15,000

* One salmon.



TWENTIETH ANNUAL REPORT

OF THE

COMMISSIONERS

ON

INLAND FISHERIES,

FOR THE

YEAR ENDING DECEMBER 31, 1885.

BOSTON:
WRIGHT & POTTER PRINTING CO., STATE PRINTERS,
18 POST OFFICE SQUARE.
1886.

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Commonwealth of Massachusetts.

To His Excellency the Governor and Honorable Council.

The Commissioners on Inland Fisheries respectfully present their Twentieth Annual Report.

FISHWAYS.

The fishways are in good working condition except that at Holyoke, which will require some repairs next spring. All applications for the construction of new fishways have been considered, and such as have been approved of have been built, except that at Hamblin's mill at Acushnet. By delay of the law, no decision has yet been reached in this case.

FISH SEEN IN THE LAWRENCE FISHWAY IN THE YEAR 1885.

- May 6. A few alewives and suckers, first of the season.
7. Alewives and suckers, run small; one lamprey.
 8. Alewives, suckers and lampreys, run small.
 9. Suckers and alewives, run small.
 10. Suckers and alewives, run small.
 11. Suckers, alewives and lampreys, run small.
 12. Suckers and alewives, run moderate; lampreys, run small.
 13. Suckers and alewives, run large; lampreys, run moderate.
 14. Suckers and lampreys, run large; alewives, run small.
 15. Lampreys and suckers, run large; alewives, run small.
 16. Lampreys and suckers, run large; alewives, run small.
 17. Lampreys and suckers, run very large; alewives run small.
 18. Lampreys and suckers, run large; alewives, run small.
 19. Lampreys and suckers, run very large; alewives, run moderate.
 20. Lampreys and suckers, run large; alewives, run moderate.
 21. Lampreys, suckers, alewives and red-fin shiners, run large.
 22. Lampreys, suckers, alewives and red-fin shiners, run large.
 23. Lampreys, suckers and alewives, run large.
 24. Lampreys and suckers, run large; alewives, run small.
 25. Lampreys and suckers, run large; alewives, run small.

- May 26. Lampreys and suckers, run large; alewives, run moderate.
 27. Lampreys, suckers and alewives, run large.
 28. Lampreys and suckers, run moderate; alewives, run small.
 29. Lampreys and suckers, run moderate; alewives, run small.
 30. *One salmon*, 10 to 12 pounds; lampreys and suckers, run small.
 31. Lampreys and suckers, run moderate; alewives, run small.
- June 1. Lampreys and suckers, run moderate.
 2. Lampreys, suckers and alewives, run small.
 3. Lampreys, run moderate; suckers, run small.
 4. Lampreys, run moderate; suckers, run small.
 5. Lampreys, run moderate; suckers, run small.
 6. Lampreys and suckers, run small (river high).
 7. Lampreys and suckers, run small.
 8. Alewives, run large; lampreys, run moderate; suckers, run small (warm day).
 9. Lampreys, alewives and suckers, run small (a cold, raw day).
 10. Lampreys and suckers, run small.
 11. Lampreys and suckers, run small.
 12. *One salmon*, 10 pounds; lampreys, alewives and suckers, run small.
 13. *One salmon*, 10 pounds; lampreys, alewives and suckers, run small.
 14. *One shad*; lampreys, alewives and suckers, run small.
 15. *One salmon*, 15 pounds; *one shad*; lampreys, alewives and suckers, run small; one red perch.
 16. Lampreys, alewives and suckers, run small; one large silver eel.
 17. Lampreys, alewives and suckers, run small.
 18. *Four salmon*, *two shad*, a few lampreys, alewives and small silver eels.
 19. *One salmon*, *one shad*, *two black bass*, a few small silver eels.
 20. *Two salmon*, a few alewives, suckers and small silver eels.
 21. Small silver eels, run small; a few suckers and alewives.
 22. A few suckers and small silver eels.
 23. A few suckers and small silver eels, one large silver eel.
 24. A few suckers and small silver eels.
 25. A few suckers and small silver eels.
 26. A few suckers and small silver eels, two alewives.
 27. A few suckers and small silver eels.
 28. A few suckers and small silver eels.
 29. A few suckers and small silver eels, two alewives.
 30. A few suckers and small silver eels.
- July 1. *One salmon*, 8 to 10 pounds; a few suckers and small silver eels.
 2. *One black bass*, a few suckers and small silver eels.
 3. A few suckers and small silver eels.
 4. *One salmon*, 8 pounds; *one black bass*, a few suckers and small silver eels.

- July 5. A few suckers and small silver eels.
6. A few suckers and small silver eels.
7. A few suckers and small silver eels.
8. *One salmon*, 8 pounds; a few suckers and small silver eels (River had risen this morning, effect of recent showers. Mr. Riddle, Fish Commissioner of New Hampshire, and a member of the New Hampshire Fish and Game Association, were present when I shut the water off at noontime and saw the salmon.)

From July 9 to the end of the month nothing in the fishway but a few suckers, silver eels and chubs.

- Aug. 1. Suckers and small silver eels, run small.
2. Suckers and silver eels (some small eels and some good size) run small.
3. Suckers and silver eels, run small.
4. Suckers, chubs and silver eels, run small.
5. *One black bass*; suckers and silver eels, run small.
6. Suckers and silver eels, run small.
7. Suckers and small silver eels, run moderate.
8. Suckers, run small; silver eels, run moderate.
9. *One salmon*, 10 pounds; *one black bass*; suckers and silver eels, run small.

From Aug. 10 to Aug. 24 nothing in the fishway but suckers and silver eels; river very high and muddy; from Aug. 15 to 21 very few fish.

25. *One black bass*; suckers, run small; a few silver eels.
26. *One black bass*; suckers, run moderate; a few silver eels.
27. Suckers, run moderate; a few silver eels.
28. Suckers and silver eels, run small.
29. *One black bass*; suckers, run moderate; a few silver eels.
30. Suckers and silver eels, run small.
31. Suckers and silver eels, run small.

From Sept. 1 to Sept. 8 nothing in the fishway but suckers, in moderate numbers, and a few silver eels.

- Sept. 9. *One black bass*; suckers, run moderate; a few silver eels.
During the remainder of September nothing but a few suckers and silver eels were in the fishway. The water was low the last part of the month, but it commenced to rise the second week in October, and the "Fall run" was as follows:

- Oct. 20. A few silver eels.
21. Two silver eels.
22. No fish.
23. Suckers, run moderate.
24. *One salmon*, 10 pounds; suckers, run large.
25. Suckers, run small.
26. Suckers, run moderate.
27. Suckers, run small.
28. Suckers, run small.
29. *One salmon*, 12 pounds; suckers, run small.

- Oct. 30. Suckers, run small.
 31. Suckers, run small.
 Nov. 1. Suckers, run small.
 2. Suckers, run small.
 3. A very few suckers; river high, and rising.
 4. No fish; river higher, and very muddy.
 5. No fish; river high, and very muddy.

T. S. HOLMES,

In Charge of Fishway.

TROUT. (*Salmo fontinalis*.)

So far as reported, the distribution of trout fry has been more successful than was anticipated. The supply has been so limited heretofore, that the number to be distributed has been inadequate to the demand.

There will be ready for delivery, next May and June, about two hundred and fifty thousand young trout; nearly double the number we had last spring. With the present arrangements at Plymouth, N. H., the annual distribution will probably be from four to five hundred thousand, which will give all an ample supply.

These are especially desirable for the western part of the State, where the waters are almost depleted of this valuable fish. From twenty to thirty thousand can be carried under the care of one person at a trip; as most railroads transport them without charge, the expense of distributing them will be small.

The following list shows the distribution for 1885:—

J. H. Whitcomb, . . .	Ayer, . . .	2 cans.
J. O. Parker, . . .	Methuen, . . .	1 can.
H. R. Peirson, . . .	Pittsfield, . . .	6 cans.
L. P. Keyes, . . .	Southfield, . . .	2 "
A. P. Tobey, . . .	Waquoit, . . .	2 "
W. H. Burlen, . . .	Sherborn, . . .	2 "
G. H. Griffin, . . .	Wareham, . . .	1 can.
A. N. Doane, . . .	Harwich Port, . . .	1 "
A. L. Lowell, . . .	Cotuit, . . .	1 "
Eben Sutton, . . .	No. Andover, . . .	2 cans.
S. V. Gifford, . . .	Duxbury, . . .	2 "
E. H. Lathrop, . . .	Springfield, . . .	6 "
L. A. Hunt, . . .	Williamstown, . . .	2 "
John Cummins, . . .	Woburn, . . .	2 "
Thos. Talbot, . . .	No. Billerica, . . .	2 "
E. G. Loomis, . . .	Bedford, . . .	2 "

J. A. Loring, . . .	Cape Cod, . . .	2 cans.
H. R. Kidder, . . .	Newton Centre, . . .	1 can.
G. W. Morse, . . .	Newtonville, . . .	2 cans.
G. M. Barnard, . . .	Cape Cod, . . .	1 can.
H. Newcomb, . . .	Greenwood, . . .	1 "
J. B. Hull, . . .	Stockbridge, . . .	1 "
J. Crane, . . .	———, . . .	1 "
M. O. Adams, . . .	Ashburnham, . . .	1 "

LANDLOCKED SALMON. (*Salmo Sebago.*)

A large number of these fish have been distributed in the waters of this State, many of them in ponds which were not suitable for them. This could not well be avoided, as the Commissioners could not visit many of the ponds and had to rely upon the statement of applicants. In some cases where it was evident that they would not thrive, the applicant insisted upon trying the experiment.

In distributing the fish we have always stated that it would probably be some years after they were planted before they would make their appearance. In some of the ponds where they were first placed and applicants had given up all hope of seeing them, they have this year appeared in considerable numbers.

The salmon fry, hatched from spawn received from Grand Lake Stream, Me., were distributed as follows: —

James O. Parker, . . .	Methuen, . . .	1 can.
J. W. Winslow, . . .	West Brewster, . . .	6 cans.
Chas. S. Bird, . . .	East Walpole, . . .	6 "
L. P. Keyes, . . .	Southbridge, . . .	4 "
Thos. H. Lawrence, . . .	Falmouth, . . .	6 "
A. N. Doane, . . .	Harwich Port, . . .	8 "
E. G. Loomis, . . .	Bedford, . . .	1 can.
B. C. Cahoon, . . .	Falmouth, . . .	6 cans.
H. H. Dame, . . .	North Reading, . . .	4 "
J. B. Hull, . . .	Stockbridge, . . .	5 "
Sam'l Parker, . . .	Wakefield, . . .	5 "
A. L. Lowell, . . .	Cotuit, . . .	1 can.
M. O. Adams, . . .	Ashburnham, . . .	5 cans.
— Small, . . .	Provincetown, . . .	2 "
L. W. Perham, . . .	Woburn, . . .	1 can.

The average number in a can was about 3,580 fish, and the number delivered to each applicant was with reference to the suitability of the water where they were to be placed.

SALMON. (*Salmo salar.*)

There has been an increased run of salmon in the Merri-mac the past year. During the last four years there have been four or five hundred thousand young salmon planted annually in the upper waters, and the return of these, if they are allowed to reach their spawning grounds, will largely increase the fish in this river, and will preclude the necessity of going elsewhere for spawn.

A few salmon have been killed at the dams during low water, but the most serious depredations have been committed near Haverhill, where, from the appearance of the dead salmon found below the falls, it was evident that the Indian spear, so commonly used in Canadian waters, was used at this place. This fact was not reported to the Commission until near the close of the season, when steps were immediately taken to arrest the parties, who escaped under cover of the darkness and did not again appear. The parties are known and will be watched. This is the only place on the river where such depredations can be successfully carried on.

But for the efforts in trying to substitute the California for the Atlantic salmon, mainly as a matter of economy, full details of which have been given in former reports, and the destruction of several hundreds of mature salmon below Lawrence in 1880-1, while on their way to their spawning grounds, the river would now be self-sustaining.

The Commissioners of Maine, who have given special attention to this subject, and whose facilities for obtaining spawn are better than in other States, have not only sustained their salmon fisheries, but have greatly increased them. The catch in their waters for the past season is reported to be the largest for fifty years.

To the Commissioners on Inland Fisheries for the Commonwealth of Massachusetts.

In January, 1885, I received from the salmon-breeding establishment at Bucksport, Maine, 340,000 Penobscot salmon eggs, 75,000 of which were given by Prof. Spencer F. Baird, U. S. Fish Commissioner, to New Hampshire. These, with the eggs

taken from the Pemigewasset or Merrimac River salmon, were successfully hatched, and the young fry were planted in the head waters of the Pemigewasset River. The plant was made without any loss, although the larger part were carried twenty miles above Livermore Falls.

The salmon were more numerous in the river than last season, but the low water in June made it difficult for them to pass the falls at Amoskeag.

During the great freshet here in August quite a large number of salmon went by here and over Livermore Falls, and they have been seen in many places above here, as far up as the east branch in North Woodstock, but I have not had any report of their being killed.

Had there been the usual amount of water in the river in June, we should have had a larger run of salmon than any year since this station was established.

The young salmon have been more numerous in the river than usual this summer, as was expected from the large plant made in 1883 and 1884.

The brook-trout eggs will exceed half a million, the large increase coming from the trout added last year.

The one-half of the trout eggs belonging to Massachusetts will be sent to you as soon as sufficiently developed to allow moving with safety.

There are now about 10,000 trout, from one year old up to six, in the breeding-ponds.

Respectfully yours,

E. B. HODGE,

Superintendent.

PLYMOUTH, N. H., Nov. 21, 1885.

SHAD HATCHING ON THE MERRIMAC.

Shad hatching was continued at North Andover during the past season, with good results. In order to avoid gilling the salmon, a net was used with a mesh of two and one-half inches, which not only enabled us to return the salmon alive to the river, but developed the fact that the river was full of young male shad from one to two years old. These young males return with the mature females, while the young females do not return until they are three or four years old, or until they are sufficiently mature to spawn.

The result of the prohibition of the use of small-mesh

seines at the mouth of the river, and the two years' hatching at North Andover, was very marked. Often from seventy-five to a hundred young shad were taken at one sweep of the seine.

By enforcing the present laws and continuing the hatching, the shad fisheries of the Merrimac, not only below, but above the dams, will be restored to much of their former value.

More shad have passed over the Lawrence fishway this year than in any previous year since it was built. The fishways on the Merrimac have been thoroughly tested, and the Commissioners of New Hampshire are satisfied that the only thing necessary to restock the river is to plant large numbers of young migratory fish in the upper waters. One hundred and seventy thousand shad were taken up this year and planted near Concord, and next year there will probably be a much larger number at their disposal.

We have stated in former reports that the fishway at Lawrence was adequate to the passage of all kinds of fish that frequent the river, and it stands to-day the only fishway over which shad are known to have passed.

We have also stated that, owing to the present appliances for their capture, migratory fish could not be maintained except by artificial hatching. This opinion is now entertained by all intelligent fish-culturists.

From important statistics obtained by Col. McDonald, Assistant U. S. Commissioner, he has been able to demonstrate that the commercial value of the increase, due to artificial hatching, has been ten times greater than the sums spent yearly by the Fish Commissioners upon works of propagation.

Rivers where artificial hatching has been continued have not only maintained their fish, but have considerably increased their numbers; while in others, where it has been neglected or temporarily abandoned, there has been an alarming decrease.

The value of the shad fisheries on the Connecticut has fallen off more than fifty per cent. on the upper part, and on the lower part twenty-five per cent; and a much larger decrease has taken place on the Merrimac. The first experiment, of only a few years, on the latter, brought the shad fisheries from an annual catch of only about one thousand, up to

seventeen thousand; but the prejudice against artificial hatching was so great that it became necessary to keep a night watch, to prevent the destruction of the hatching boxes.

The work was an experiment, and under this state of feeling it was thought best to temporarily suspend operations, and await results.

The third year after this the catch of shad began to fall off, and continued in its downward tendency until last year, the third since hatching was resumed, when there was a decided change for the better.

The prejudice has given place to a more intelligent appreciation of the work; it is no longer an experiment, and a wise policy demands that the artificial hatching for the maintenance and increase of the shad fisheries should be vigorously prosecuted. The expense is small, and the results as certain as that of any other culture.

To the Commissioners on Inland Fisheries :

GENTLEMEN, — We respectfully submit the following report, giving the full details of the hatching of shad at North Andover for the year of 1885.

The hatchery was opened June 10th, and closed July 15th.

Number of shad taken,	. . . . .	704
returned to river alive,	. . . . .	490
given away,	. . . . .	214
of males,	. . . . .	546
of females,	. . . . .	158
of salmon taken,	. . . . .	7
returned to river alive,	. . . . .	7

It will be seen by this table that nearly eighty per cent. of the fish taken were males. Of the 158 females, 88 were in a condition to furnish spawn. The amount of eggs was estimated to be fully 528,000, a yield of 6,000 per fish. This seems to be a small amount when we consider the fact that a full-grown female contains 40,000 eggs; but the eggs do not all become mature at the same time, consequently but few are taken from each fish.

The number of shad hatched was not far from 500,000. Of this number 170,000 were sent by rail to the Fish Commissioners of New Hampshire; and, as I am informed by Mr. Riddle, one of the Commissioners, these were turned into the Merrimac near Manchester. The balance, 330,000, were turned into the Merrimac at North Andover. The following table will show the number of fish taken

each day, the temperature of the water and air, the proportion of males to females, the time of drawing the seine ; also the number of fish taken at each sweep and the estimated amount of spawn taken each day.

1885.	No. Shad taken.	Males.	Females.	Temperature of Water at 7 p.m.	Temperature of Air at 7 p.m.	Time of hauling seine. (p. m.)	Fish per sweep.	Estimated number of eggs taken.
June 10, .	-	-	-	-	-	-	-	-
11, .	14	11	3	68	68	7, 8,	3, 11,	000
12, .	26	21	5	69	67	7, 8, 9,	5, 10, 11,	000
13, .	45	40	5	71	68	7, 8,	11, 34,	000
15, .	18	18	0	75	70	6, 9,	2, 16,	20,000
16, .	42	38	4	77	72	8, 9,	16, 26,	15,000
17, .	64	57	7	76	63	6, 7, 8, 9, 10,	2, 2, 32, 15, 13,	25,000
18, .	37	26	11	77	67	8, 9,	17, 20,	20,000
19, .	44	37	7	77	68	8, 9, 10,	15, 17, 12,	20,000
20, .	38	26	12	78	70	8, 9,	26, 12,	10,000
22, .	32	28	4	76	63	7, 8, 9,	20, 3, 9,	17,000
23, .	9	9	0	70	60	8, 9,	1, 8,	000
24, .	43	34	9	72	64	8, 9, 10,	10, 18, 15,	50,000
25, .	38	30	8	73	65	8, 9, 10,	8, 18, 12,	40,000
26, .	29	22	7	76	72	8, 9, 10,	8, 12, 9,	35,000
27, .	17	12	5	76	70	8, 9, 10,	4, 5, 8,	26,000
29, .	14	10	4	75	68	7, 8, 9,	4, 1, 9,	12,000
30, .	26	20	6	75	64	8, 9,	6, 20,	20,000
July 1, .	16	10	6	72	60	8, 9,	6, 10,	25,000
2, .	22	14	8	72	58	8, 9, 10,	3, 12, 7,	000
3, .	8	3	5	72	64	8, 9,	4, 4,	000
6, .	28	18	10	76	68	8, 9,	15, 13,	50,000
7, .	19	14	5	76	66	7, 8,	10, 9,	30,000
8, .	24	21	3	78	77	8, 9,	15, 9,	25,000
9, .	10	7	3	80	75	8, 9,	3, 7,	10,000
10, .	10	6	4	80	74	9, 10,	7, 3,	18,000
11, .	9	5	4	78	64	8, 9,	8, 1,	10,000
13, .	8	4	4	79	63	8, 9,	4, 4,	25,000
14, .	11	5	6	76	64	7, 8,	8, 3,	25,000
15, .	3	0	3	76	69	7, 8,	3, 0,	000

The water remained high all the season, and, as was predicted in the last report, there was a decided increase in the run of fish. Many hundreds of young shad were taken. They were of two sizes — from one-half to one pound in weight; they were returned to the river alive.

We are confident that the enforcement of the act of the legislature in reference to the use of fine-mesh seines at the mouth of the river, is having a good effect; in fact, it is the only protection the young fish can have. There are good reasons for anticipating a much larger run of fish in the Merrimac in 1886 than has been seen for the last fifteen years.

The increase in the number taken in 1885, at the hatching station at North Andover, as compared with the number taken in 1884, was over three hundred per cent.

Yours truly,

B. P. CHADWICK.

ROBT. ELLIOT.

BRADFORD, Aug. 20, 1885.

THE RESULTS OF SHAD PROPAGATION ON THE ATLANTIC COAST.

[From "Science" of Nov. 13, 1885.]

At a recent meeting of the Biological society of Washington, Col. Marshall McDonald read a paper upon the necessity of artificial propagation, in relation to the maintenance of the shad fisheries. He argued that the shad fisheries depend upon artificial production for their maintenance. This theory was illustrated by a comparison of statistics for 1880 and 1885, and a consideration of the attendant conditions. The figures for 1880 were taken from the census reports; those for 1885 from a recent reconnoissance by experts, usually the same persons who made the census reports. He brought together the statistics of all the rivers of the Atlantic slope. The catch in each river fluctuates under local conditions. It is not true that shad, spawned in certain rivers, necessarily return to the same rivers. They remain, it is true, in the geographical area in which they were spawned, but may seek any fresh water within that area. It is only by taking the statistics of the rivers of the entire area that it could be determined whether there had been an actual increase or decrease. Table I. giving "Comparative statistics of the shad fisheries of the Atlantic rivers," was submitted.

TABLE I.—Comparative Statistics of the Shad Fisheries of the Atlantic Coast Rivers from Cape Cod, Mass., to Cape Henry, Va., for 1880 and 1885.

	Number of Shad taken in 1880.	Number of Shad taken in 1885.	Per cent. of Increase or Decrease.	Remarks.
Connecticut River and tributaries,	268,608	215,000	25% Decrease.	The aggregate increased catch of shad in 1885 over 1880 amounted to— In quantity 1,050,000 lbs. In value \$73,530
Hudson River,	781,628	1,174,028	33% Increase.	
Delaware River and Bay,	735,300	1,148,496	36% Increase.	
Chesapeake Bay and its tributaries,	2,084,600	1,632,600	21% Decrease.	
Aggregate catch,	3,870,136	4,170,124	7.3% Increase.	

TABLE II. — *Comparative Statistics of the Shad Fisheries of Chesapeake Bay and its Tributaries for 1880 and 1885.*

	Number of Shad taken in 1880.	NUMBER OF SHAD TAKEN IN 1885.		Total Number of Shad taken in 1885.	Per cent. of Increase or Decrease.	Remarks.
		In Salt Water.	In Fresh Water.			
By pound net fisheries in Chesapeake Bay outside of the mouths of the rivers,	593,243	713,448	-	713,448	20% Increase.	67% of all shad taken in the Chesapeake and its tributaries in 1885 were taken in salt or brackish water before reaching spawning grounds.
Susquehanna River and minor tributaries at the head of Chesapeake Bay,	614,000	50,000	162,161	212,161	65% Decrease.	The 33% taken by the river fisheries on, or in the vicinity of, their spawning grounds, being captured for the most part before they had spawned, it will be seen that we are dependent for natural reproduction upon the small number of shad that escape the pound nets and elude the energetic pursuit of the river fishermen.
Potomac River,	582,800	60,000	97,697	157,697	74% Decrease.	
Rappahannock River,	134,000	220,000	30,000	250,000	86% Increase.	
York River (all salt water) catch, included in the pound net fisheries of the bay,	-	-	-	-	-	
James River,	106,000	45,000	200,000	245,000	131% Increase.	
Minor tributaries of the Chesapeake on eastern shore of Maryland and Virginia,	54,500	27,250	27,250	54,500	-	
Aggregate catch,	2,084,543	1,115,698	517,108	1,632,806	21% Decrease.	

While the commercial value of the increase was not large compared with the whole, that sum was ten times as great as the yearly sum spent by the Fish Commission upon the work of propagation.

In order to arrive at a measure of the increase or decrease of the shad fisheries of the Atlantic coast rivers, it is necessary to compare the aggregate catch in the principal rivers. Conclusions based upon the fluctuations of catch in a single river are necessarily fallacious, since such fluctuations are due to local causes. So far as the shad is concerned, all the rivers draining into the Atlantic between Cape Cod and the capes of the Chesapeake, and the submerged continental borders lying between the coast line and the Gulf Stream, constitute a single zoölogical province, within the limits of which the migrations of the shad are confined.

In February and March, when their migrations into continental waters begin, the direction of their movements is largely determined by temperature conditions existing in the area in which they are. The principal migration may be into the Chesapeake, or it may be up the coast into the Delaware, the Hudson, and the Connecticut; but in either case the aggregate catch will furnish a just measure of increase or decrease. A comparison of the statistics of the fisheries for 1880 and 1885 (see Table I.) shows a gain of nearly eight per cent. in the aggregate catch. The significance of this, as showing the value and necessity of artificial propagation, will be better appreciated by considering the adverse conditions under which it has been accomplished:—

1. Access to suitable spawning grounds in fresh water is a physiological necessity.

2. Access in sufficient numbers to compensate by natural reproduction, waste by casualty or capture, is necessary to prevent the eventual destruction of our shad fisheries if we rely upon natural reproduction solely.

3. Existing adverse conditions limit natural reproduction, so that we cannot depend upon it to keep up supply.

- (a) Dams in our rivers have curtailed the spawning areas to less than half of what they formerly were.

- (b) The spawning grounds still accessible have been

destroyed by the pollution of the waters, which are thus rendered unfit to sustain the delicate embryo shad.

(c.) The change in the location of the fishing grounds, and the increasing proportion of shad taken year by year outside of the mouths of the rivers, or in the rivers before they have reached spawning grounds, has so reduced natural reproduction as to render it an insignificant factor in keeping up supply.

Under such conditions, the spawning area being limited, and the shad excluded from fresh water, without artificial propagation, the shad must soon be exterminated, or there must at least be such reduction as to render the fisheries unprofitable. Such a crisis was fast approaching in 1879, when the Fish Commission began the work of shad propagation. The work of artificial propagation has not only held the balance even, but resulted in a slight increase.

Colonel McDonald deprecated the methods employed in shad fishing, especially the use of pound nets. In the Connecticut River, where pound nets are used, the greater part of the catch is taken in salt water. In the Hudson, since the laws of New York do not permit fishing with pound nets, the river is not obstructed to the same extent as the Connecticut. In the Delaware, where an increase is shown, there are no pound nets. In the Chesapeake and its tributaries, with a decrease of 21 per cent., 713,000 of the shad caught this year, or more than one-half of the whole catch, were caught in the salt water of the bay. The pound nets begin at the capes, and extend to the mouth of the Potomac. Prior to 1871 the shad were taken entirely in fresh water, but now over one-half are caught in salt water. In the Potomac River nearly one-half of the catch is made in water where the fish cannot spawn. In the Rappahannock one-half the catch is in brackish water. In the York River the catch is practically below Gloucester Point. In the James River there are no pound nets, and in that river is an increase in the catch. While the fisheries in the Chesapeake Bay and its tributaries, as a whole, have fallen off 21 per cent., the decrease in the catch in certain rivers is much greater. The catch in the Susquehanna in 1880 was 614,000, against 212,000 in 1885; and in the Potomac, 552,857 in 1880,

against 157,697 in 1885. The reason of this is obvious. In 1871 there were no pound nets in Chesapeake Bay, and no shad were taken until they entered fresh water. Gilling was not prosecuted so low down the river as now. In 1880 there were in Chesapeake Bay 180 pound nets set in the track followed by the shad along the western shore, and through these the shad had to run a gauntlet up to the mouths of the rivers. Now there are 1,000 pound nets, occupying the western shores of the bay, and excluding the fish from the fresh water. The effect of the salt-water fishery is to diminish natural reproduction, and to invoke artificial propagation as a necessary aid to the fisheries. If all shad were excluded from our rivers for three or four years, without artificial propagation, the species would be exterminated. Taking all the facts into consideration, and the inadequacy of natural reproduction to supply the annual loss, we must credit artificial reproduction not only with having maintained the fisheries where they were, but with an increase which repays ten times the cost of the work of shad propagation, as carried on by the U. S. Fish Commission and those of the several States.

While Col. McDonald's statistics are important, showing as they do the value of artificial propagation, he has probably fallen into an error in stating that shad do not necessarily return to the rivers and streams where they are bred. There are no facts, that we are aware of, to sustain such an assertion, while on the other hand there is abundant evidence proving that rivers once depleted of migratory fish are never restocked except by artificial means. There are rivers in this State where migratory fish were all destroyed, and for forty years not a vestige of them was seen, which, however, were easily restocked by putting into their headwaters young fish, hatched from spawn taken from adult fish of other waters.

To the Commissioners on Inland Fisheries

GENTLEMEN, — In making my report on the fisheries of the lower Merrimac, I have but little to say. No menhaden have appeared in the river during the past season, and no vessels, outside of

Newburyport, have been here for bait. What the fishermen call sea shad were found in small numbers on the 12th of June, and ten days' fishing resulted in taking about sixteen hundred of them, which were sold for about one hundred dollars.

There were about one hundred and fifty dollars worth of blue-fish taken in August. In September some excitement was created by the report that there was a large school of sea shad in the river. These reports are periodical, and often break out without any real foundation, so that it is difficult to find out the facts without considerable labor.

Although satisfied in my own mind that the report was not true, I went down with the fishermen, and, as directed by your Chairman, allowed them to use their seines, which resulted in the taking of two hundred two-year-old shad. As these fish, in my judgment as well as that of the fishermen, belonged to the Merrimac, all that could be were returned to the water alive.

This fact shows the importance of protecting the river; for, had free fishing been carried on, as it practically was before the enforcement of the law, all the labor of restocking the river would have been destroyed. These young shad were undoubtedly the males that accompanied the females up the river in May and June.

Less young shad have been destroyed this season, than at any time in my memory, and I have been familiar with the fisheries there from my boyhood.

One hundred barrels of bait have been caught, mostly used for eel-pots; and, in addition, about fifty barrels of spirling. The whole amount for the fisheries for the season cannot exceed, in round numbers, three hundred and fifty dollars; it will therefore be seen that the fishing for bait here has been almost an entire failure.

A portion of the fishermen appear to be satisfied with the present arrangements, while others would not be contented with anything short of the right to take everything in the river regardless of the consequences.

The lobster law has been enforced on this part of the coast, as well as it could be with the limited means at my disposal. Three persons were arrested and convicted for catching and retaining short lobsters at the mouth of Ipswich River, two of whom were old offenders.

Yours truly,

EDWIN F. HUNT.

LEASED PONDS.

The last legislature repealed the authority for leasing ponds. Whether this was wise legislation, is a question upon which there is a decided difference of opinion. There are in this State one hundred and ninety-six thousand three hundred and forty-three acres of land covered with water, capable of yielding an annual income of nearly a million of dollars.

A question of so much importance cannot be easily laid aside, and, as the public become better informed in regard to it, will be likely to come up for further consideration. So far as we know the public sentiment is in favor of some regulation or protection of these waters.

As the leased ponds are allowed fishing until the first of December, the returns received up to the time of going to press are, in many cases, estimates, and not made up from returns of all the permits issued. In most instances where intelligent control has been exercised, there appears to have been a decided increase of the fish.

The lessees of Onota Lake have made the following report, which we commend to other lessees as the only way in which correct data can be had from year to year of the increase of the fish under their charge : —

PITTSFIELD, Nov. 28, 1885.

Report of fish caught in Onota Lake for the year 1885.

Black bass,	1,500 lbs
Pickrel,	1,000 "
Yellow perch,	2,000 "
Rock bass,	2,000 "
Bull-heads,	200 "
White perch (a few in number).	
Wall-eyed pike,	5½ "
Landlocked salmon (11 in number),	25 "
Total,	6,730 lbs.

Landlocked salmon, which were introduced into this pond several years ago, and were reported to be an entire failure, have now begun to make their appearance.

CARP CULTURE.

The cultivation of carp has already, in the Southern and Western States, become an important industry, and an American Carp-cultural Association has been formed, with a wide extended membership of experienced fish-culturists.

But little has been done in this State, owing to a prevailing impression that Massachusetts is too far north for the successful cultivation of this fish. That this idea is erroneous, is clearly shown by several large ponds in the State, already heavily stocked with carp, the largest, perhaps, being that belonging to the Green estate in Worcester, containing, as it does, nearly seventy-five acres. This pond is made by throwing a dam across the foot of a meadow; there is no stream running into it, but it is mainly supplied by the water-shed, and was originally intended for a reservoir for supplying the insane asylum with water.

In October, 1881, Mr. Green obtained 19 carp from the State hatching-house, Winchester; and in November, from other sources, 47 more, making in all 66. They have grown and bred very rapidly, so that now the pond is full of carp from four to twelve, eighteen and twenty-five inches long, and Mr. Green is satisfied that some of the oldest will weigh from twelve to sixteen pounds.

He has not, himself, marketed any, but has allowed his children to take out a few which they sold to a fish-dealer at eighteen cents per lb.

Although this pond is not arranged as a carp pond should be, having none of the appliances of fish-culture, and at best is simply a matter of maintenance, it fully demonstrates the advantage that might accrue to thousands of our farmers, who have suitable places for the rearing of these fish.

In order to give the best information that can be had on this subject, and also to answer the numerous inquiries that are being made, we have published, in the supplement, extracts from the reports of the United States Commissioner, giving full information.

Through the kindness of Prof. Baird, the State received, about the 20th of October, two thousand young carp, which have been distributed as follows:—

George Sibley,	Salem,	50
Aug. Fels,	Lowell,	50
W. O. Cutter,	East Wareham,	50
W. H. P. Wright,	Lawrence,	30
Liberty Allen,	Fiskville,	30
E. Howe,	East Brookfield,	50
E. Chace,	Swansea,	50
H. W. Dudley,	Abington,	30
Eben Sutton,	North Andover,	50
S. N. Small,	South Brewster,	50
A. N. Doane,	Harwich Port,	50
G. A. Sammet,	Boston,	60
George W. Morse,	Newton,	50
Edward Mott,	Taunton,	30
W. H. Abbott,	South Easton,	100
C. H. Wise,	Boston,	50
A. F. Crowell,	North Falmouth,	50
E. G. Elliot,	Bradford,	30
A. Wiggin,	Stratham, N. H.,	30
G. M. French,	Holliston,	25
J. D. Ellis,	West Dedham,	30
D. M. Ayer,	Methuen,	50
C. A. Howland,	Adams,	50
L. Rawson,	Holliston,	30
J. Fottler, Jr.,	Boston,	25
M. A. Herrick,	Winchester,	30
J. P. Woodworth,	Chicopee,	55
F. C. Wetherhed,	Auburn,	50
Tewksbury Reservoir, . . . . .	. . . . .	600

Arrangements have been made to supply all who have suitable ponds and will make application for them before the first of September, giving full description of pond, and stating what kinds of fish, if any, are now in them. Where parties are unknown to the Commissioners, the application should be endorsed by the senator or representative of the district where the parties belong.

Carp can be forwarded to any part of the State by express. The interest in the distribution and cultivation of fish is increasing, and the demand for fry this year was greater than in any previous year.

The introduction of carp alone will add considerable to the work of the Commission. This fish offers to all who have suitable places an easy cultivation and certain return. They

are of especial importance to the farmer in the interior of the State, where fish are not readily obtained.

RETURNS OF WEIRS, SEINES AND GILL-NETS.

Returns have been received from 184 fisheries of the following kinds : 80 pounds or weirs, 19 sea seines, 59 gill-nets, 1 Connecticut River seine, 2 Merrimac River seines, 10 Taunton River seines, and 13 other fresh-water seines. On comparison with the season of 1884, it appears that 21 less returns were received this year. Five men who returned last year have sent word that they are no longer fishing, but these are more than offset by seven from whom returns are received for the first time, so it is probable that the decrease is due to non-compliance with the law. It is, however, gratifying to note that most of the names reappear year after year, and that many fishermen are in sympathy with the work of the Commission.

Notwithstanding the diminished number of fisheries, there is, as compared with 1884, a gain in the catch of shad, alewives, sea-herring, mackerel, tautog and flatfish, and a loss in the catch of menhaden, striped bass, scup, squeteague, Spanish mackerel, bluefish and eels.

The increase of 7,648 in the shad caught, is due to a marked increase in the number taken in pounds and weirs, but the river fisheries also report more than last year.* The decrease in the catch of bluefish seems to be general and not confined to any particular method of fishing, so that it is probable that this fish was less abundant than in recent years. Among the returns under the heading of "other edible fish" a decided increase in the catch of shore cod is noted. On the 14th of May one salmon, and on the 29th, two salmon, were caught in weirs at Provincetown.

E. A. BRACKETT.

F. W. PUTNAM.

E. H. LATHROP.

* Of the 1,718 shad caught in the Connecticut at South Hadley, 150 are set down as "small shad."

EXPENSES OF COMMISSION.

Salary,	\$1,685 00	
Travelling expenses	264 66	
		\$1,949 66

GENERAL EXPENSES.

Expenses Joint Hatchery at Livermore Falls, N. H.

E. B. Hodge, services,	\$450 00	
Services of Assistant,	134 25	
Fish meat,	39 50	
Rent of cottage,	37 50	
Expressage,	7 43	
Salmon,	8 62	
House,	961 59	
		\$1,638 89

Expenses at Lawrence Fishway.

Thomas S. Holmes, services,	\$70 00	
Lumber and labor,	28 00	
		\$98 00

Expenses Shad Hatching Establishment, North Andover.

E. F. Hunt, services,	\$252 00	
expenses,	49 73	
John L. Murphy, services	31 00	
E. S. Robinson, services,	31 00	
Patrick Barrett, services,	31 00	
Robert Elliot, services,	62 00	
B. P. Chadwick, services,	82 50	
expenses,	17 06	
		\$556 29
Daniel T. Devoll, legal services,		50 00
A. B. Coffin, legal services,		30 00
Jennie Smith, clerical services,		20 00
Rent of land at Winchester for fish hatching,		50 00
Web,		8 93
Printing,		11 79
Plans of Fishway at Yarmouth,		5 00
North Harwich		5 00
Subscription to Fund of Penobscot Salmon Breeding Estab-		
lishment, 1885-6,		600 00
Expressage,		45 28
J. C. Walker, labor at Winchester hatching house,		20 00
Subscription to Fund of Schoodic Salmon Breeding Estab-		
lishment, 1885-6,		300 00
Tin pails for carp,		17 00
		\$5,405 84

APPENDIX.

[A.]

LIST OF FISH COMMISSIONERS.

[From "Forest and Stream."]

DOMINION OF CANADA.

[We cannot learn that any appointment has been made to the office vacated by Mr. W. F. Whitcher two years ago.]

PROVINCE OF NEW BRUNSWICK.

W. H. Venning, Inspector of Fisheries, . . . St. John.

PROVINCE OF NOVA SCOTIA.

W. H. Rogers, Inspector, Amherst.

PROVINCE OF PRINCE EDWARD ISLAND.

J. H. Duvar, Inspector, Alberton.

PROVINCE OF BRITISH COLUMBIA.

A. C. Anderson, Victoria.

THE UNITED STATES.

Prof. Spencer F. Baird, Washington, D. C.

ALABAMA.

Col. D. R. Hundley, Huntsville.

Hon. Charles S. G. Doster, Prattville.

ARIZONA.

J. J. Gosper, Prescott.

Richard Rule, Tombstone.

J. H. Taggart, Business Manager, Yuma.

ARKANSAS.

James H. Hornibrook, Little Rock.

H. H. Rottaken, Little Rock.

CALIFORNIA.

R. H. Buckingham, President,	. . .	Washington.
A. B. Dibble, Secretary and Treasurer,	. . .	Grass Valley.
J. D. Redding,	San Francisco.

COLORADO.

John Pierce,	Denver.
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CONNECTICUT.

Dr. Wm. M. Hudson,	Hartford.
Robert G. Pike,	Middletown.
James A. Bill,	Lyme.

DELAWARE.

Enoch Moore,	Wilmington.
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GEORGIA.

Hon. J. T. Henderson, Commissioner of Agriculture,	Atlanta.
Dr. H. H. Cary, Superintendent of Fish- eries,	LaGrange.
Under the laws of the State these two consti- tute the Board of Fish Commissioners.		

ILLINOIS.

N. K. Fairbank, President,	. . . . .	Chicago.
S. P. Bartlett, Secretary,	Quincy.
Maj. Geo. Brenning,	Centralia.

INDIANA.

Enos B. Reed,	Indianapolis.
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IOWA.

A. W. Aldrich,	Anamosa.
A. A. Mosher,	Spirit Lake.

KANSAS.

S. Fee,	Wamego.
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KENTUCKY.

Wm. Griffith, President,	Louisville.
P. H. Darby,	Princeton.
John B. Walker,	Madison.
Hon. C. J. Walton,	. . . . .	Munfordville.
Hon. John A. Steele,	. . . . .	Versailles.
W. C. Price,	. . . . .	Danville.
Dr. W. Van Antwerp,	. . . . .	Mt. Sterling.
Hon. J. M. Chambers,	. . . . .	Independence, Kenton Co.
A. H. Goble,	. . . . .	Catlettsburg.
J. H. Mallory,	. . . . .	Bowling Green.

MAINE.

E. M. Stilwell, Commissioner of Fish and Game,	. . . . .	Bangor.
Henry O. Stanley, Commissioner of Fish and Game,	. . . . .	Dixfield.
B. W. Counce, Commissioner of Sea and Shore Fisheries,	. . . . .	Thomaston.

MARYLAND.

G. W. Delawder,	. . . . .	Oakland.
Dr. E. W. Humphries,	. . . . .	Salisbury.

MASSACHUSETTS.

E. A. Brackett,	. . . . .	Winchester.
F. W. Putnam,	. . . . .	Cambridge.
E. H. Lathrop,	. . . . .	Springfield.

MICHIGAN.

Dr. J. C. Parker,	. . . . .	Grand Rapids.
John H. Bissell,	. . . . .	Detroit.
Herschel Whitaker,	. . . . .	Detroit.
(W. D. Marks, Superintendent,	. . . . .	Paris.)
(A. J. Kellogg, Secretary,	. . . . .	Detroit.)

MINNESOTA.

1st District — Daniel Cameron,	. . . . .	La Crescent.
2d District — Wm. M. Sweney, M. D.,	. . . . .	Red Wing.
3d District — Robt. Ormsby Sweeny, President,	. . . . .	St. Paul.
(S. S. Watkins, Superintendent,	. . . . .	Red Wing.)

MISSOURI.

J. G. W. Steedman, 2803 Pine Street, St. Louis.
 John Reid, Lexington.
 Vacancy.

NEBRASKA.

W. L. May, Fremont.
 R. R. Livingston, Plattsmouth.
 B. E. B. Kennedy, Omaha.

NEVADA.

Hon. Hubb G. Parker, Carson City.

NEW HAMPSHIRE.

George W. Riddle, Manchester.
 Luther Hayes, Milton.
 E. B. Hodge, Plymouth.
 (E. B. Hodge, Superintendent.)

NEW JERSEY.

Richard S. Jenkins, Camden.
 William Wright, Newark.
 F. M. Ward, Newton.

NEW YORK.

Hon. R. Barnwell Roosevelt, Pres., 17 Nashua St., New York.
 Gen. Richard U. Sherman, Secretary, New Hartford, Oneida Co.
 Eugene G. Blackford, 809 Bedford Ave., Brooklyn.
 William H. Bowman, Rochester.
 Seth Green, Superintendent, Rochester.
 Fred Mather, Superintendent, Cold Spring Harbor.
 Monroe A. Green, Superintendent, . . Mumford, Monroe Co.
 F. A. Walters, Superintendent, Bloomingdale, Essex Co.

NORTH CAROLINA.

M. McGehee, Raleigh.
 Logan Terrell, Assistant, Raleigh.

OHIO.

Col. L. A. Harris, President, Cincinnati.
 George Daniels, Sandusky.
 James Dority, Toledo.
 (Henry Douglass, Superintendent, Sandusky.)

PENNSYLVANIA.

John Gay, President,	.	.	.	.	Greensburg.
H. H. Derr, Secretary,	.	.	.	.	Wilkesbarre.
Arthur Maginnis,	.	.	.	.	Swift Water, Monroe Co.
A. M. Spangler, Corresponding Secretary,	.	.	.	.	Philadelphia.
Aug. Duncan, Treasurer,	.	.	.	.	Chambersburg.
Charles Porter,	.	.	.	.	Corry.

RHODE ISLAND.

John H. Barden,	.	.	.	.	Rockland.
Henry T. Root,	.	.	.	.	Providence.
Col. Amos Sherman,	.	.	.	.	Woonsocket.

SOUTH CAROLINA.

Hon. A. P. Butler, Commissioner of Agriculture,	.	.	.	.	Columbia.
C. J. Huske, Superintendent of Fisheries,	.	.	.	.	Columbia.
These two constitute the Fish Commission.					

TENNESSEE.

W. W. McDowell,	.	.	.	.	Memphis.
H. H. Sneed,	.	.	.	.	Chattanooga.
Edward D. Hicks,	.	.	.	.	Nashville.

VERMONT.

Hiram A. Cutting,	.	.	.	.	Lunenburg.
Herbert Brainerd,	St. Albans.

VIRGINIA.

Col. Marshall McDonald,	Berryville.
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WEST VIRGINIA.

C. S. White, President,	Romney.
N. M. Lowry, Secretary,	Hinton.
F. J. Baxter, Treasurer,	Braxton Court House.

WISCONSIN.

The Governor, *ex officio*.

Philo Dunning, President,	. . .	Madison.
C. L. Valentine, Secretary and Treasurer,	. . .	Janesville.
J. V. Jones,	. . . . .	Oshkosh.
A. V. H. Carpenter,	. . . . .	Milwaukee.
Mark Douglass,	. . . . .	Melrose.
C. Hutchinson,	. . . . .	Beetown.
(James Nevin, Superintendent,	. . . . .	Madison.)

WYOMING TERRITORY.

Dr. M. C. Barkwell, Chairman,	. . .	Cheyenne.
Otto Gramm, Secretary,	. . .	Laramie.
N. L. Andrews,	. . . . .	Buffalo, Johnson Co.
E. W. Bennett,	. . . . .	Warm Springs, Carbon Co.
P. J. Downs,	. . . . .	Evanston, Uinta Co.
T. W. Quinn,	. . . . .	Lander, Sweetwater Co.

[B.]

LIST OF PONDS LEASED

*By the Commissioners on Inland Fisheries, under Authority given by Chap. 384, Sect. 9, of the Acts of 1869.**

1870.

- Feb. 1. Waushakum Pond, in Framingham, to Sturtevant and others, 20 years.
April 1. Mendon Pond, in Mendon, to Leonard T. Wilson and another, 20 years.
Sept. 12. Baptist Lake, in Newton, to J. F. C. Hyde and others, 20 years.

1871.

- April 17. Long Pond, in Falmouth, to Joshua S. Bowerman and three others, 20 years.
May 15. Pratt's Pond, in Upton, to D. W. Batcheller, 20 years.
18. Little Sandy Pond, in Plymouth, to William E. Perkins, 15 years.
Nov. 1. Punkapoag Pond, in Randolph and Canton, to Henry L. Pierce, 20 years.

1872.

- Jan. 1. Sandy Pond, Forest Lake, or Flint's Pond, in Lincoln, to James L. Chapin and others, 20 years.
July 20. Little Pond, in Braintree, to Eben Denton and others, 20 years.

* We would remind lessees of ponds that they are required, by their leases, to use all reasonable efforts to stock their ponds, and keep accurate records of the same, and make returns of their doings to the Commissioners on the 1st of October, each year, of the number and species of fish which they have put in or removed from their ponds. Any failure to comply with these conditions is a breach of contract invalidating their lease. It is important that the State should know just what is being done; and, where there appears to be mismanagement or apparent failure, the Commissioners will visit the ponds, and ascertain, if possible, the cause.

1873.

- May 1. Meeting-house Pond, in Westminster, to inhabitants of Westminster, 15 years.
1. Great Pond, in Weymouth, to James L. Bates and others, 15 years.
- July 1. Little Sandy Pond, in Pembroke, to A. C. Brigham and others, 16 years.
- Sept. 1. Pontoosuc Lake, in Pittsfield and Lanesborough, to E. H. Kellogg and others, 15 years.
- Oct. 1. Farm Pond, in Sherborn, to inhabitants of Sherborn, 15 years.
1. Spot Pond, in Stoneham, to inhabitants of Stoneham, 15 years.
- Dec. 1. Lake Wauban, in Needham, to Hollis Hunnewell, 20 years.

1874.

- Mar. 1. Walden and White ponds, in Concord, to inhabitants of Concord, 15 years.
2. Upper Naumkeag Pond, in Ashburnham, to inhabitants of Ashburnham, 20 years.
- April 1. Elder's Pond, in Lakeville, to inhabitants of Lakeville, 15 years.
20. North and South Podunk ponds, in Brookfield, to inhabitants of Brookfield, 15 years.
- May 1. Maquan Pond, in Hanson, to the inhabitants of Hanson, 15 years.
2. Brown's Pond, in Peabody, to John L. Shorey, 15 years.
16. Wickaboag Pond, in West Brookfield, to Lemuel Fulham, 15 years.
20. Unchechewalom and Massapog ponds, to the inhabitants of Lunenburg, 20 years.
- July 1. Hardy's Pond, in Waltham, to H. E. Priest and others, 15 years.
1. Hockomocko Pond, in Westborough, to L. N. Fairbanks and others, 15 years.
11. Mitchell's Pond, in Boxford, to R. M. Cross and others, 15 years.
11. Hazard's Pond, in Russell, to N. D. Parks and others, 20 years.
- Oct. 1. East Waushacum Pond, in Sterling, to inhabitants of Sterling, 20 years.
20. Middleton Pond, in Middleton, to inhabitants of Middleton, 15 years.

1875.

- Jan. 1. White and Goose ponds, in Chatham, to George W. Davis, 15 years.
- Mar. 1. Hood's Pond, in Ipswich and Topsfield, to inhabitants of Topsfield, 15 years.
- April 1. Chauncey Pond, in Westborough, to inhabitants of Westborough, 15 years.
3. West's Pond, in Bolton, to J. D. Hurlburt and others, 15 years.
15. Gates Pond, in Berlin, to E. H. Hartshorn and others, 15 years.
24. Pleasant Pond, in Wenham, to inhabitants of Wenham, 15 years.
- May 1. Morse's Pond, in Needham, to Edmund M. Wood, 15 years.
1. Chilmark Pond, in Chilmark, to J. Nickerson and others, agents, 20 years.
- July 1. Winter Pond and Wedge Pond, in Winchester, to inhabitants of Winchester, 15 years.
1. Haggett's Pond, in Andover, to inhabitants of Andover, 20 years.
- Aug. 1. Oyster Pond, in Edgartown, to J. H. Smith and others, 20 years.
7. West Waushacum Pond, in Sterling, to inhabitants of Sterling, 20 years.
9. Mystic (Upper) Pond, in Winchester, Medford, and Arlington, to inhabitants of Winchester and Medford, 15 years.
- Oct. 1. Little Chauncey and Solomon ponds, in Northborough, to inhabitants of Northborough, 15 years.

1876.

- Feb. 1. Great Sandy Bottom Pond, in Pembroke, to Israel Thrasher and others, 15 years.
- Mar. 1. Dennis Pond, in Yarmouth, to inhabitants of Yarmouth, 15 years.
- Mar. 1. Crystal Lake, in Wakefield, to Lyman H. Tasker and others, 15 years.
20. Lower Naumkeag Pond, in Ashburnham, to inhabitants of Ashburnham, 18 years.
28. Dennison Lake, in Winchendon, to inhabitants of Winchendon, 15 years.
28. Phillipston Pond, in Phillipston, to inhabitants of Phillipston, 20 years.

1876.

- May 8. South-west Pond, in Athol, to Adin H. Smith and others, 15 years.
- June 1. Norwich Pond, in Huntington, to inhabitants of Huntington, 20 years.
10. Dug Pond, in Natick, to W. P. Bigelow and others, 15 years.
- Oct. 1. Farm and Learned's Pond, in Framingham, to inhabitants of Framingham, 15 years.
1. Whitney's Pond, in Wrentham, to inhabitants of Wrentham, 15 years.
1. Little Pond, in Barnstable, to George H. Davis, 15 years.

1877.

- Mar. 1. Nine-Mile Pond, in Wilbraham, to inhabitants of Wilbraham, 15 years.
15. Pentucket and Rock ponds, in Georgetown, to inhabitants of Georgetown, 15 years.
- Aug. 10. Onota Lake, in Pittsfield, to William H. Murray and others, 15 years.
- Oct. 1. Fort, Great Spectacle, and Little Spectacle ponds, in Lancaster, to inhabitants of Lancaster, 20 years.
- Nov. 1. Tispaquin Pond, in Middleborough, to Abishai Miller, 15 years.

1878.

- Jan. 1. Sniptuit, Long, Snow, and Mary's ponds, in Rochester, to inhabitants of Rochester, 15 years.
- Mar. 16. Asnaconcomic Pond, in Hubbardston, to Amory Jewett, Jr., 15 years.
- April 1. Dorrity Pond, in Millbury, to inhabitants of Millbury, 10 years.
- May 1. Bear Hill Pond and Hall Pond, in Harvard, to inhabitants of Harvard, 15 years.
5. Spectacle, Peters, and Triangle ponds, in Sandwich, to George L. Fessenden, 10 years.
- Oct. 1. Eel Pond, in Melrose, to J. A. Barrett and others, 15 years.
1. Accord Pond, in Hingham, South Scituate, and Rockland, to inhabitants of those towns, 10 years.
1. Wright's and Ashley's ponds, in Holyoke, to Henry C. Ewing and others, 10 years.
1. Magog Pond, in Acton and Middleton, to inhabitants of Acton, 15 years.

1879.

- Feb. 1. Lake Mahkunac and Lake Overic, in Stockbridge, to inhabitants of Stockbridge, 10 years.
- July 1. Silver Lake, in Wilmington, to inhabitants of Wilmington, 10 years.
1. Fresh Pond, in Falmouth, to Thomas H. Lawrence, 20 years.
- Oct. 1. Pomp's Pond, in Andover, to inhabitants of Andover, 15 years.
- Nov. 1. Lake Quinapowitt, in Wakefield, to inhabitants of Wakefield, 14 years.

1880.

- Mar. 1. Lake Winthrop, in Holliston, to inhabitants of Holliston, 15 years.
15. Massapoag Pond, in Sharon, to inhabitants of Sharon, 10 years.
- May 1. Tisbury Great Pond, in Tisbury, to Allen Look and others, 10 years.
- June 1. Indian Pond, in Kingston, to inhabitants of Kingston, 10 years.
1. Jordan Pond, in Shrewsbury, to inhabitants of Shrewsbury, 15 years.
- July 1. Swan and Martin's ponds, in North Reading, to inhabitants of North Reading, 15 years.
- Sept. 1. Herring Pond, in Eastham, to William H. Nickerson, 10 years.
- Dec. 24. Chadwick's Pond, in Bradford and Boxford, to town of Bradford, 10 years.

1881.

- Jan. 1. Great and Job's Neck ponds, in Edgartown, to Amoz Smith and others, 15 years.
- Mar. 1. The Mill Ponds (three), in Brewster, to Valentine B. Newcomb and another, 15 years.
- April 1. Long Pond, in Blandford, to Samuel A. Bartholomew and another, 15 years.
- May 2. Nonesuch Pond, in Weston and Natick, to W. A. Bulard and others, 15 years.

1882.

- Mar. 1. Blair's Pond, in Blandford, to Curtis M. Blair and another, 15 years.
- April 1. Ward Pond, *alias* Wightman Pond, in Ashburnham, to Herbert F. Rockwood and another, 15 years.
- May 1. Horn Pond, in Woburn, to inhabitants of Woburn, 15 years.
- June 1. Wickaboag Pond, in West Brookfield, to inhabitants of West Brookfield, 15 years.

1883.

- Mar. 1. Halfway Pond in Plymouth, taken by Commissioners for 5 years, in accordance with provisions of Chap. 62, Acts of 1876.
- April 6. Fresh Pond, in Tisbury, to Allen Look and others, 15 years.
23. Keyes Pond, in Westford, to M. H. A. Evans, 15 years.
- May 7. Singletary Pond, in Sutton and Millbury, to towns of Sutton and Millbury, 15 years.
7. The Great Pond, in Ashfield, to town of Ashfield, 15 years.
- July 1. Lake Buell, in Monterey and New Marlborough, to town of New Marlborough, 10 years.

1884.

- June 1. Bald Pate, Four-Mile, and Stiles ponds, in Boxford, to inhabitants of Boxford, 10 years.
- July 15. Asneybunskeit Pond, in Paxton, to inhabitants of Paxton, 10 years.
15. Center Pond, in Dennis, to inhabitants of Becket, 10 years.
15. Buckmaster Pond, in Dedham, to Francis Soule and others, 10 years.
15. Fresh Pond, in Dennis, to inhabitants of Dennis, 10 years.
17. Farm Pond, in Cottage City, to John C. Hamblin and others, 15 years.
18. Mashpee, Great, and Wakeley ponds, in Mashpee, to inhabitants of Mashpee, 10 years.
- Aug. 30. Sand Pond, in Ayer, to inhabitants of Ayer, 15 years.
- Sept. 5. Great Pond, in North Andover, to inhabitants of North Andover, 15 years.

[C.]

CARP AND CARP PONDS:

ANSWERS TO 118 QUESTIONS RELATIVE TO GERMAN CARP.

BY CHARLES W. SMILEY.*

During the past fifteen months the correspondence of the United States Fish Commission has included a great number of letters of inquiry concerning the German carp. The 118 questions here considered have all been taken from letters received during that period, and most of the questions have been asked over and over again. As they cover considerable of the practical information required, it is hoped that the answers here given will be valuable. Fuller information upon many of the points may be obtained from published documents of the Commission. I am indebted to Col. M. McDonald for assistance in preparing some of the answers.

The questions and replies are classified under sixteen heads, so that one can easily find any information he is seeking.

I. — GENERAL INQUIRIES.

1. Is carp a pond fish? A. Yes; pre-eminently so. It is especially adapted to small bodies of still water, and the water need not be free from mud and sediment.

2. Is carp a game fish? A. Not properly so, though some correspondents report that they consider it to have game qualities.

3. What time of year do carp appear after hibernation? A. As soon as the spring fairly sets in, which differs much in the different parts of the United States. It is probable that the carp will not hibernate at all in Southern Texas.

4. Can small carp be wintered in a cellar? A. Yes, if provided with proper food, change of water, &c.

5. Will young fry swim on top of water? A. No. What is sometimes mistaken for young carp is the top minnow (*Zygonectes*).

6. Do carp live a long time out of water? A. They are quite hardy, and can be kept alive out of water, if in moss, twenty-four hours. * * *

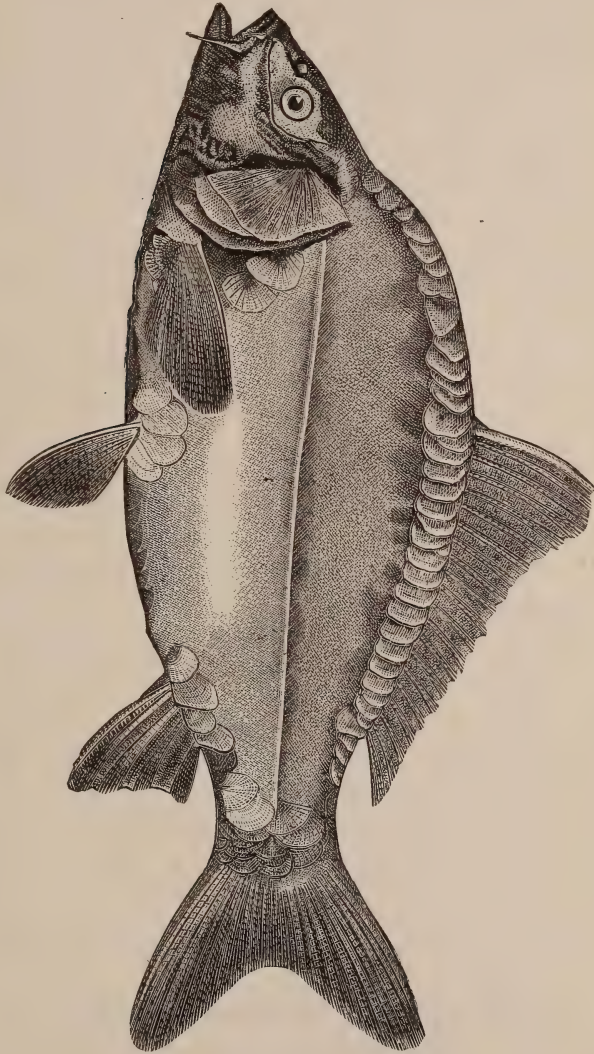
* In Bulletin of the U. S. Fish Commission, Sept. 3, 1883.

II. — VARIETIES OF CARP.

8. Are scale and leather carp different varieties? A. Yes.

9. Do carp have scales all over? A. Scale carp do, and leather carp do not.

Leather carp (*Cyprinus carpio*.)



10. What is the best breed of carp? A. Scale carp are the most prolific, the leather carp grow the fastest, and the mirror is intermediate between them.

III.—CARP AS A FOOD-FISH.

11. What kind of food-fish is carp? A. Equal or superior to catfish, suckers, perch, and all our common native varieties. Many correspondents declare them equal to trout, bass, and shad, but this is not claimed for them by the Fish Commission.

12. At what age are carp suitable for table use? A. When small the bones are troublesome, but the flavor is the same. When they weigh 4 pounds or more the bones can be easily removed.

13. What season of the year are carp fit for the table? A. From October to May. During and for several months after spawning the flesh is soft. No fish is in good condition to eat for some time after its spawning time. * * *

IV.—PONDS AND TANKS.

15. How large a pond is necessary for carp? A. Larger the better, but a small one of a few yards square will answer for a few fish.

16. How should one prepare a carp pond? A. This is answered at length in articles on the subject published by the Fish Commission.

17. Is it absolutely necessary to be able to drain ponds to the bottom? A. No; but very desirable, so as to remove other fish, enemies of the carp, &c.

18. What kind of soil is best adapted for carp? A. Loamy or muddy soil. The carp roots about in it for grubs, worms, larvæ, &c.

19. Is it best to make the border of the pond sloping or vertical? A. It is easiest to let it slope, and there is usually no particular advantage in making it vertical.

20. What is the best way to construct a dam? A. See plans and descriptions published by the Fish Commission.

21. What is the best material for constructing a dam? A. Stone and earth.

22. What is the best plan of an escape way? A. See plans of ponds by Fish Commission.

23. How should one prevent fish escaping from the pond? A. Make the dam secure, and put wire cloth over the outlet.

24. Will carp leave a pond when it overflows? A. Not if the superfluous water is colder than the bottom water, as is often the case in floods.

25. How should one prevent carp leaving pond at overflow?

A. Arrange wire sieves for the overflow to pass through. Avoid overflow if possible by regulating the amount of water flowing in by means of a waste weir.

26. Will carp do well in ditches of cranberry bogs? A. Yes; if free from other fish, turtles, snakes, &c.

27. Will carp live in ornamental fish tank? A. Yes.

V.—WATER FOR CARP.

28. What kind of water is adapted to carp? A. Warm water. They grow very slowly in cold water.

29. Will carp live in shallow water? A. Yes; even if so shallow that their backs sometimes protrude from the water, but there should be one deep spot for them to go to in winter.

30. Is shallow or deep water best for carp? A. Shallow water is usually warmer, and hence better for carp. Better have both, if possible.

31. What temperature of water is best adapted to carp? A. High temperatures. They can live in cold water, but do not grow much. They thrive in warm water.

32. Is slow-running water suitable for carp? A. They are sluggish and care nothing about running water.

33. Will carp live if water is not running through pond? A. Yes; all the better.

34. Will carp live in reservoirs of rain water in Texas? A. The rain water might become too stagnant and injure them, but if kept sweet the carp could live. However, no more food should be put in than they can eat.

35. Will muddy water hurt carp? A. No. It is their delight. They can usually get food from it.

36. Is well or spring water best adapted to carp? A. It makes no difference. Neither is desirable.

37. Are streams suitable for trout good for carp? A. No. Trout require clear, cold water; carp, warm water, and it need not be clear.

38. Are mineral waters bad for carp? A. Cannot tell without knowing more about the mineral water. Brackish water is not injurious.

39. Will carp live in Rocky Mountain waters? A. Probably live, but not grow much, because the water is too cold.

40. Will carp do well in limestone water? A. Yes.

41. Is alkali water detrimental to carp? A. Unknown.

VI.—PLANTS FOR CARP PONDS.

42. What plants are best for carp? A. Crowfoots, cowslips, water-milfoil, bladderwort, hornwort, cress, water-rice, water-mace, water-oats, Indian rice, water-lilies,—especially the last six.

43. Is grass in pond injurious to carp? A. Not injurious.

44. Can water-cresses be too thick in a carp pond? A. Yes. The pond must not be allowed to entirely grow up to vegetation.

VII.—THE CARE OF CARP.

45. Would carp succeed if placed in a common pond and left to take care of themselves? A. About the same as when chickens and pigs are left to take care of themselves.

46. Can carp be placed in a pond at any season of the year? A. Yes; but do not transfer them suddenly from warm to cold or cold to warm water.

47. What is the best time of day to deposit carp? A. When you can avoid a violent change in temperature.

48. Will horses going to water interfere with eggs? A. No.

49. Will it harm carp to cut ice in the pond where they are? A. No. They will be so fast asleep in the mud they will not care.

VIII.—FOOD FOR CARP.

50. Do carp need feeding? A. Yes, to grow fast. They can, however, pick for themselves just as chickens can.

51. What is best food for carp? A. Cooked cereals and vegetables, such as corn, wheat, rye, potatoes, cabbage, turnip, lettuce, pumpkins, melons, &c.

52. How often should carp be fed? A. As often as convenient, if food does not accumulate in their pond. You can habituate them to come to a place for food just the same as other animals. Better feed them morning and night, one or both.

53. Are boiled rice and corn bread suitable diet for carp? A. Yes; excellent.

54. Is brewer's grain suitable feed for carp? A. Yes.

55. Is it best to feed salad food to carp? A. No harm.

56. Will kitchen scraps kill carp? A. Not unless salt, pepper and mineral substances are mixed in. Salt mackerel, salt meat, &c., should be excluded. Potatoes, corn, cabbage, lettuce, and other vegetables are suitable.

57. Are water-cresses essential for carp food? A. Not essential, but desirable.

58. Will carp eat tadpoles? A. No.

IX. — GROWTH OF CARP.

59. How large do carp grow? A. Sometimes to 50 or 75 pounds.

60. How long does it take carp to grow? A. It depends entirely on the temperature of the water and amount of food.

61. How much will a carp three years old weigh? A. If in Pennsylvania, four or five pounds; if in Georgia, six to eight pounds. They can be forced to much greater weights by feeding.

62. What climate is best adapted to the carp? A. Warm climate.

X. — SPAWNING OF CARP.

63. At what age and time of year do carp spawn? A. Usually at the age of three years; often at two; sometimes at one in southern climates, when fed well. The month of spawning varies in different latitudes, but it usually occurs in May in the South and in June in the North. In cold water it may be protracted into July.

64. Will carp two years old spawn? A. That depends on climate, food, &c.

65. At what age will the male carp vivify the eggs? A. Probably younger than that at which the female deposits eggs.

66. How can one tell male from female? A. It is impossible until about spawning time, unless you cut them open.

67. Which is the larger, male or female carp? A. The female.

68. Do size of scales on carp indicate sex? A. No.

69. Are carp prolific? A. Yes; if properly cared for. A five-year-old carp ought to contain 500,000 eggs.

70. How many young will a pair of carp produce annually? A. Very few, if left to themselves; a great number, if properly cared for — say 50,000.

71. What arrangements are to be made at spawning time? A. Put the spawners by themselves till the eggs are deposited, and then protect the eggs from other animals. A good way is to put hemlock boughs in the pond to receive the eggs. These can be taken out covered with eggs and placed in water to hatch, where the eggs will not be eaten or destroyed. Keep the young out of the way of enemies.

72. Is it best to remove old fish from pond at spawning time? A. It is a good idea. See answer to last question.

73. How long should young carp be kept in small pond before turning into larger pond with other fish? A. Till large enough to defend themselves. Say till they weigh a pound each.

74. How distinguish carp spawn from frog or other spawn? A. Carp spawn is deposited singly on branches, grasses, &c., and is about the size of number 8 shot. Frog spawn is deposited in a jelly-like mass.

75. Do young carp resemble tadpoles? A. No.

XI. — ENEMIES OF CARP.

76. Will carp destroy their young? A. Not if they can get any other food.

77. Will carp destroy other fish? A. No. The carp does not injure any other fish, but is injured by many kinds.

78. Will dace hurt carp? A. The minnows will eat the carp eggs.

79. Do frogs destroy the spawn of fish? A. Yes; they eat both spawn and young fishes.

80. Will goldfish destroy carp, and *vice versa*? A. Yes; besides they will mix — hybridize.

81. Will green frogs destroy carp? A. Yes; they eat eggs and young carp.

82. Will minks destroy carp? A. Yes; they will exterminate them.

83. Will mud-cat injure carp? A. They will eat the eggs and young carp.

84. Will mud-turtles eat carp? A. Yes, to extermination.

85. Will roaches feed on the carp spawn? A. Yes.

86. Do snakes eat carp? A. Yes.

87. Will suckers injure carp? A. Yes.

88. Will trout destroy carp? A. Yes.

89. How can one guard carp from frogs, tadpoles, water-rats, and turtles? A. Kill the frogs, tadpoles, rats and turtles.

90. How can I get tadpoles out of the pond? A. Drain the pond.

91. How get rid of cat-fish in carp ponds? A. Drain the pond.

92. What varieties of fish can carp associate with without detriment? A. There is no kind of fish that will not eat carp eggs and the young carp when they get the chance. Keep carp by themselves.

93. What varieties of fish are detrimental to carp culture? A. See previous question and answer.

94. Will mountain and lake trout, salmon and carp thrive in the same pond? A. No. Trout and salmon require cold, run-

ning water, and would eat carp eggs and young. The carp require warm, still water, and to be by themselves.

95. Will gum in holly trees in pond injure carp? A. No.

96. Will mulberry trees around a pond hurt the fish? A. No.

97. Will vegetable matter covered by water decompose and hurt the carp? A. Yes; if in great quantities.

XII. — DISEASES OF CARP.

98. What is the cause of fungus on carp? A. The cause is not known, but it results from a weak condition of the carp and from getting hurt.

99. What is the cure of fungus on carp? A. Prevention is possible, as shown by answer to previous question. No cure is yet known.

100. What is the cause of mouldy appearance of carp? A. This is the fungus spoken of in the two previous questions.

XIII. — HOW CARP CAN BE CAUGHT.

101. How are carp caught? A. Best by a dip-net. They can be enticed by food into shallow water and then taken by a dipper, rake, or even by the hands.

102. Can carp be caught with hook and line? A. Not very readily. They are shy biters, but a number have reported taking them with hooks baited with meat.

103. What bait is best to catch carp? A. Teach them to come to a shallow spot or to a plank a few inches under water, by feeding them at such a place, and while they are eating they can be taken in the hands full as readily as chickens are. They are very tame and will eat out of the hand.

XIV. — THE DISTRIBUTION OF CARP.

104. How can carp be obtained? A. By filling out blank application to United States Fish Commission and sending through a United States Senator or Representative to Prof. S. F. Baird.*

105. Who can indorse carp applications? A. Members of Congress and Senators of the United States.

106. What time of the year do you distribute carp? A. From October to April.

107. How old are carp distributed? A. Three to nine months.

108. Are carp distributed according to population of each State, or according to number of applications? A. According to number of applications.

* Or to the State Commissioners.

109. How many fish per acre are required to stock a pond? A. That depends on the amount of food available. A small pond may be made to produce thousands of carp. A pond one acre can be made to sustain 500 one-pound carp.

XV. — THE TRANSPORTATION OF CARP.

110. During transportation of fish, will moss in the water prevent their being bruised? A. Water-moss may be used to advantage, as it helps keep the water pure.

111. Is it safe to ship carp by stage? A. They have been sent safely in a quart pail by all sorts of conveyances. It is essential that water enough remain in the pail to cover the carp.

112. Can young carp be carried on horseback? A. Yes; by keeping them covered with water.

XVI. — FINANCIAL INQUIRIES.

113. What will carp cost? A. The United States Fish Commission distributes them free. The recipient pays only the cost of transportation from Washington, or from such centres of supply as it establishes.

114. What are young carp worth per thousand? A. The Government does not sell any. Private parties sometimes sell them at \$5 per pair. A New Jersey carp-culturist advertises "selected minor carp at \$85 per hundred, and selected scale carp at \$80 per hundred; no orders filled for less than \$25."

115. Can I raise 100 pounds carp cheaper than 100 pounds chicken? A. Yes; as cheaply again.

116. How many pounds of carp per annum will a pond one acre square produce? A. Very few if neglected; very many if wisely cared for. Five hundred one-pound carp ought to weigh 1,500 pounds the second year, and 2,500 pounds the third year.

117. Are carp known among fish dealers? A. They are a very important item with dealers in Europe. They were introduced into the United States so recently that but very few get into the markets yet. A correspondent in Saline County, Missouri, recently wrote that "large numbers of young carp, a foot long, are being taken from the Missouri River and sold in the market."

118. What are carp worth per pound in the market? A. Very few have yet reached the markets in the United States.

DIRECTIONS CONCERNING THE CONSTRUCTION OF CARP PONDS.

[Condensed from the report of the Maryland Fish Commission for 1880.*]

The cultivation of carp is of sufficient importance to fully warrant the construction of ponds for the purpose. But there already exist in many places ponds used for the collection of ice, or for supplying water to live stock, which could be converted into carp ponds at a comparatively small cost. There are also many depressions of surface in the lands which could be filled with water with but little labor, and made to answer the purpose admirably.

It is very desirable, on several accounts, that the ponds should be so constructed as to permit the water to be drawn off. The fish can then be captured and assorted, when those intended for breeding can be returned to the pond and the remainder placed in tanks from which to be taken, by the aid of dip-nets, as required for market or for food. Drawing off the water is also desirable for destroying such enemies of the fish as may be therein.

In the case of ponds supplied by the inflow of tide-water, eggs of other fishes are often wafted in, and the fish thus produced may consume the food, eggs, and young of the carp. By draining the ponds once or twice a year these intruders can be readily removed.

To utilize an ice pond for carp is very simple. It is not necessary that the drainage from the surrounding fields should be diverted, except when excessive in quantity or liable to become so after a heavy fall of rain. A certain amount of such drainage often proves beneficial, as considerable quantities of food are thus conveyed into the ponds. If admitted, an "overflow" must be provided, which should be well protected by wire-cloth screens to prevent the escape of the fish. This overflow constitutes the most important feature in the construction of a pond.

For illustration, Fig. 1 is a pond located in a meadow, through which flows a small stream. The pond is formed upon two sides by embankments of earth obtained by the removal of a portion of the soil from the inclosed space. The water may be supplied either by introducing it from the rivulet itself at some higher point, or, as in this illustration, from a spring in the adjacent meadow, supplemented by the surface, drainage from the surrounding high land. A small tributary of the rivulet is utilized in this instance to carry

* From the Bulletin of the U. S. Fish Commission, Sept. 3, 1883.

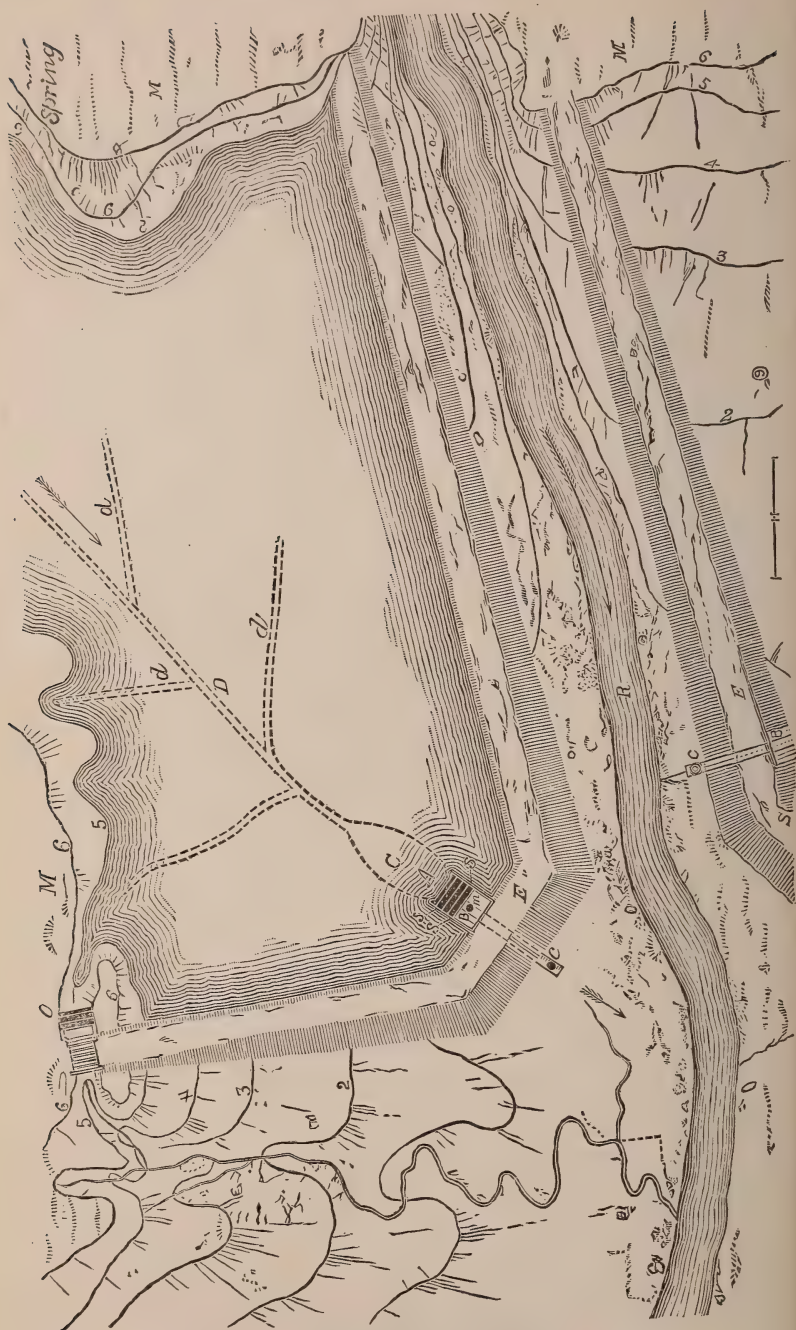


FIG. 1. — A carp pond built in a meadow.

off the surplus water, which is allowed to escape from the pond through the overflow O. A is the apparatus for emptying the pond. B is a frame inclosing the end of the discharge pipe leading from the pond, and provided with the screens *s s s*. C is the "collector," into which the fish are drawn by the lowering of the water in the pond, and *c* a valve which controls the flow of the water through the discharge pipe *m*. D is a wide, shallow drain, having branches, *d d d d*, by means of which all of the water is led into the collector when the pond is being emptied. E represents the embankments, which are about 6 feet in height at the angle of the pond in the lowest part of the meadow.

In Fig. 2 the upper portion presents a longitudinal section of the pond. The lower part shows a portion of the same section enlarged, so that the arrangement of the pond is clearly illustrated. The fish are readily drawn into the collector C. A hook for removing the planks *g g g* is shown at *h*.

The "overflow" indicated at O is very important, and especial attention is directed to its construction. This outlet is located in the solid ground at the side of the pond rather than in any part of the embankment, which might be weakened by its presence; and is protected by three wire-cloth screens of varying texture, the coarser mesh being placed farthest in the pond in order to collect all drift, and thus prevent the clogging of the second and third screens, the meshes of which should be fine enough to preclude the escape of the smallest fish. The screens are so placed as to present a considerable surface below the water-level, to insure them against being clogged by drift. This arrangement will always afford a free exit to the water beneath the mass of rubbish.

The general details of the outlet A are indicated in the views given. The screens *s s s*, as well as those of the "overflow," are disposed in a frame-work, and should slide easily in their grooves, so that they may be removed and cleaned. An additional set of such grooves, are provided at this outlet, and these which are the innermost are furnished, instead of screens, with solid planks *g g g* the edges of which are neatly fitted to each other so as to render their joints water-tight. The upper edge of each plank is provided with staples or eyes *f f f*, through which the hook *h* may be passed to lift the plank from the frame. When the planks are in position these eyes are received into slots *n n* in the lower edge of the planks above them, so as to allow them to fit closely together.

The purpose of this fourth, and *solid*, screen is to lower the water in the pond by drawing it from either the surface or the bottom, as may be deemed most advisable. To draw it from the surface only, it will simply be necessary to open the valve *c*; and to remove the planks in succession as the water subsides, while to draw from the

bottom will require all the planks to be first removed; and the valve to be opened when this has been done..

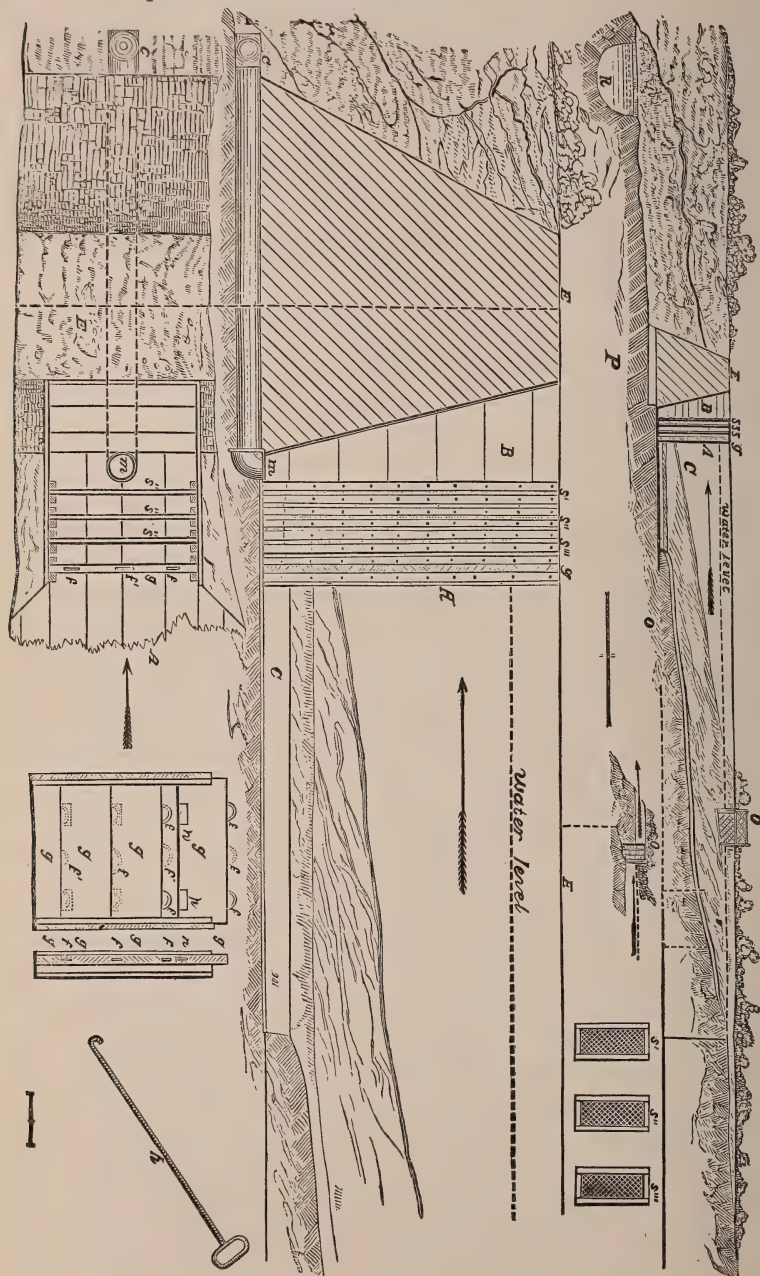


FIG. 2. — Sectional view of the dam of carp pond.

In addition to the valve *c*, the drain-pipe *P* may be provided at *m* with a clog or strainer, to guard it against the accumulation of

rubbish. The collector C should be placed at the lowest point in the pond, and, unless excavated in hard clay, should be floored and faced with plank, cement, or other hard material. Carp have a strong tendency to bury themselves in the mud, not only during hibernation, but whenever alarmed or pursued. If the collector has been constructed as suggested, and the fish gradually drawn into it, danger of loss on this account will be obviated.

The details of the "overflow," "outlet," "collector," &c., may be varied, according to the circumstances; but the general requirements of a pond so located as to receive its supply of water at one end and to discharge it at the other are here indicated.

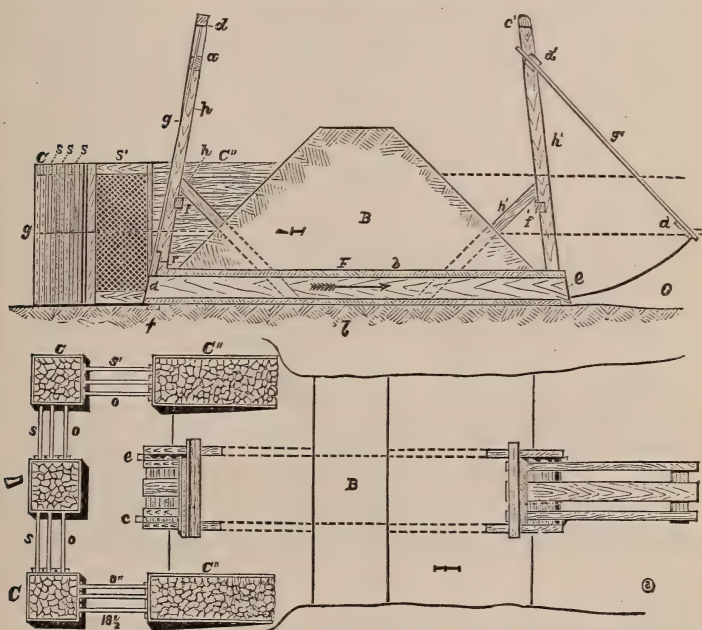


FIG. 3.

Ponds should not be less than three feet in depth at their deepest part—to insure the fish against being frozen in severely cold weather—and should gradually lessen to a depth of one or two inches to provide the shoals required for spawning. Small knolls and islands should be removed, as they generally afford harbor for the enemies of carp.

FOR PONDS IN TIDAL REGIONS. — The collector and drain ditches should be constructed and arranged as above, the collector being formed at the lowest point within the embankment. The "overflow" may be omitted, as the "flume" can be readily adapted to the purposes of carrying off any surplus water. As the flume

requires constant attention to insure its operation, the "overflow" should be retained, if practicable, and be placed in firm ground.

Fig. 3 represents a vertical section, and corresponding horizontal projection of the embankment B, showing the position of the flume F, and its controlling valves, *d d*, together with that of the crib-work "C C C," which is construed on the pond side, and is designed to support the screens.

The flume is placed, as before, on a level with the bottom of the collector, and the valves are arranged for drawing the water from

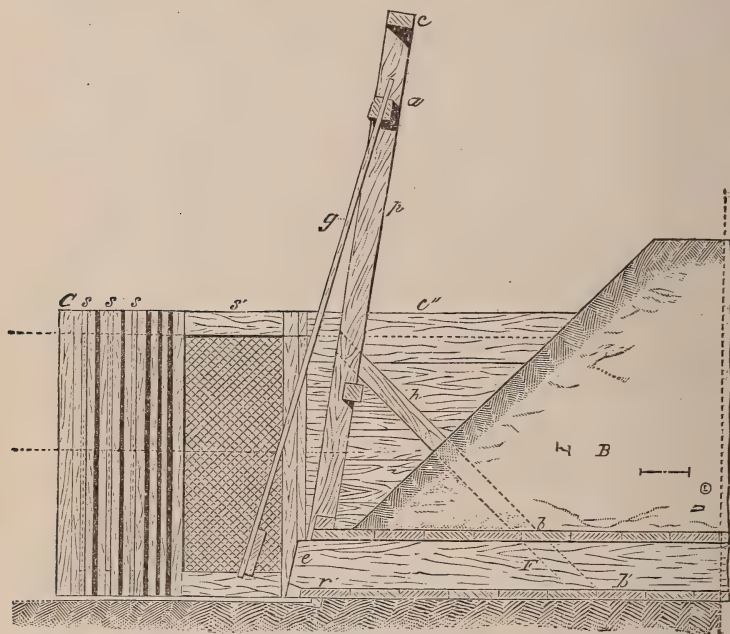


FIG. 4.

the pond, at ebb tide. The inner valve has been slightly raised by *sliding* upward its support *g* through the grooved trunnion *a*; and the pressure of the water flowing through the flume, in the direction of the arrow, serves to *swing* open the outer valve, and to keep it open until the pond is emptied or the tide turns. In the latter event the outer valve closes automatically until the level of the water without again falls below that of the water remaining in the pond when its operation is resumed.

Should it be desired, on the other hand, to admit water from the river *into* the pond — at the proper levels — the relative positions and operations of the valves would, of course, be reversed. The outer valve should then be raised so as to allow the water to enter the flume from the river; and the inner valve should be lowered,

in turn, to permit it to swing with the current, and to close automatically with the cessation of its flow.

Figs. 4, 5, 6 and 7 represent portions of the above considerably enlarged for the purposes of a more detailed description. The flap-valve *d*, which is here represented as being forced slightly open by the presence of the inflowing current, is attached to the lower extremities of the long strips or pieces *g g g*, arranged to slide upward through mortises in the beam *a*. The latter, in turn, is provided at each end with trunnions fitting loosely into corresponding sockets in the uprights *p p*, by which means the beam and its depend-

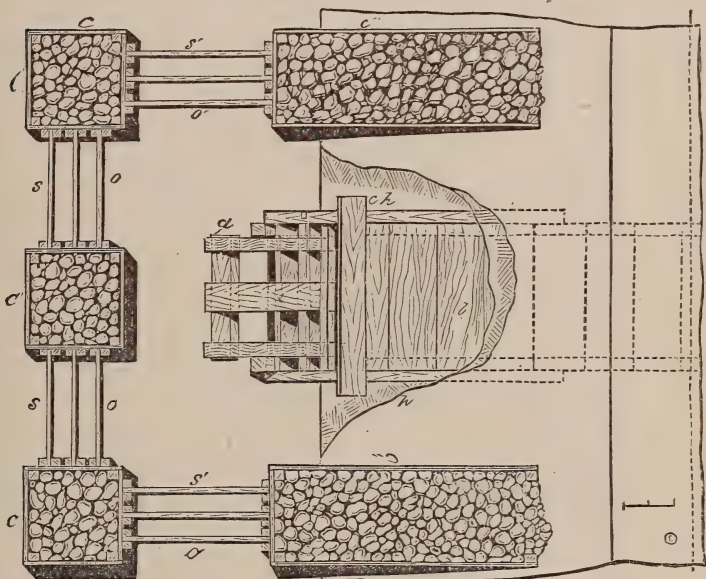


FIG. 5.

ent parts are allowed to swing readily in place, as indicated by the positions of the gate or valve in the several diagrams.

Another and fixed beam, indicated at *f*, serves as an additional support to the uprights *p p*, and as the fulcrum of a lever by means of which the gate may be raised or lowered. "C C C" represent crib-work, filled with stones, and sustaining in position the screens *s s* and *o o*, which are arranged to slide in their respective grooves, similarly to those already described.

Fig. 7 is a flume or trunk of simpler design, which may be constructed by hollowing out one side of a stout log, for nearly its entire length, and covering the groove thus formed with pieces of thick plank. The bark should be allowed to remain undisturbed, where practicable, for a protection to the wood. The general arrangement of the flume and its valves is indicated in the diagram

As the valves do not work automatically, such a “plug-trunk”—as it is called—would appear to be better adapted for ponds located in other than tidal regions.

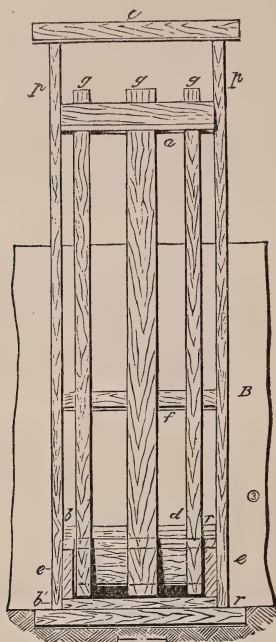


FIG. 6.

So much of the wood-work, in all these constructions, as is exposed to the air, and particularly such parts as are subject to the

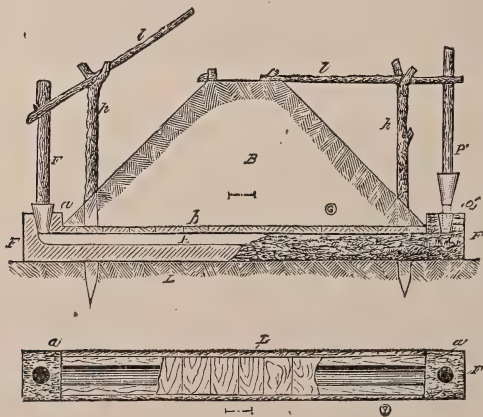


FIG. 7.

alternate action of the air and water, are liable to decay, and should be protected by thick coatings of paint, or other preservative material. Such parts as are imbedded in the earth will last for years.

TAKING THE FISH FROM THE PONDS.

[Extract from Report of RUDOLPH HESSEL, superintendent of the United States carp ponds at Washington, D. C.*]

The emptying out of ponds demands the greatest caution and attention. The water must be made to flow off very gradually through the several outlets, all of which are to be kept open at the same time; it requires frequently from ten to eighteen days to draw off the water. The fishes are driven carefully and slowly with boats into the principal ditches. They must not be chased on any account, or they will bury themselves in the mud; occasionally many thousands will do so within a few moments, and will remain there, pressed together closely, and so perish through suffocation. This is recorded as having occurred from time to time, when during the process of driving them into the ditches the fishes were startled by some unknown cause and all sank into the mud instantaneously. Through the impossibility of extricating them speedily enough, many hundreds and even thousands perished, the owner sustaining heavy losses in consequence. To guard against such an emergency, preparations should be made for an immediate supply of water in similar cases, in order to save the fishes. If the fishing-out progresses in the regular manner, the fishes will by degrees draw off from the ditches into the collector. The collecting takes from five to six days in large ponds, containing frequently 100–400 tons of fishes. Care should be taken, that crowding them together may be avoided. On the evening before the fishing-out, when the water of the pond has been diminished to the depth of half a foot, those fishes which have been collected are shut off from the pond by a large net, and in the early morning, at the dawn of day they are caught. As so large a number of fishes cannot be disposed of at once they are transferred to the so-called market-ponds, from which they are sold by degrees to fish-dealers. These market-ponds are quite small, capable of holding from 2,000 to 3,000 pounds of fish only, and are supplied with running water.

Those who never saw the fishing-out of a carp pond can scarcely imagine the beautiful sight of so many thousand fine fishes, fat and well fed, raising their high broad backs and thick, puffy lips above the water, their heads side by side, all being nearly of the same

* From Report of U. S. Commissioner of Fish and Fisheries.

size, weighing from four to five pounds, their bodies closely pressing against each other, looking like an immense herd of sheep, imprisoned in one large net upon a circumference of 3,000 to 4,000 feet. Closer and closer the circle is drawn around them, until its extent measures only about two acres, when they are caught by thousands, weighed in lots of 100 pounds, and then they are placed in the market-ponds. The pikes, which have reached an almost equal weight, are put into pike-ponds. It requires often two or three days to weigh the fishes, ponds of 1,000 or 2,000 acres area containing on an average 200 tons of carp and 20 tons of pike, tench and other fishes not included.

I assisted once at the fishing-out of one of these ponds, which took place in the neighborhood of the town of Guben Pleitz, province of Brandenburg, Germany. The pond was the property of a competent culturist and valued friend, Mr. Thomas Berger, of Georgenhof, near Cottbus-Peitz. The ponds in which this gentleman carries on carp culture exceed the extent of 6,000 Prussian acres. The pond which was fished out at the time I speak of was but a small one, not more than 200 acres in size, yet to my surprise I found that the greater number of the fishes were fine specimens of about 3 pounds weight, though they were but in their second year, having weighed no more than $1\frac{1}{4}$ pounds five short months before (the fishing-out took place at the beginning of October), and they had attained to this great weight in a comparatively very limited space of time. Several establishments of this kind are located in that district, and they commonly belong to some large princely domain (crown property). They are, like all large fisheries, admirably managed, and the results are most satisfactory.

6.—MIXED CARP-CULTURE.

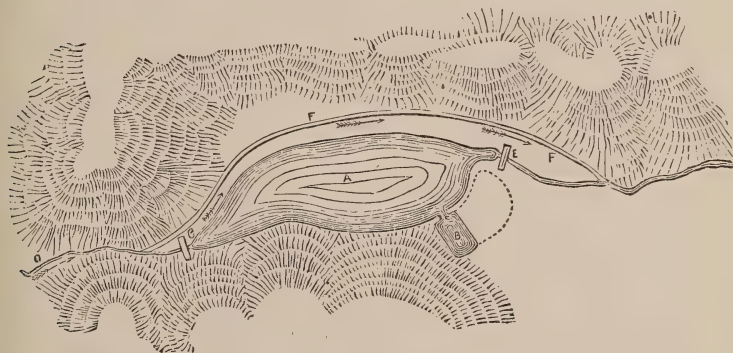
We have so far spoken of carp-culture, according to the different age of these fish, in special ponds (hatching, breeding, and carp ponds), termed "class culture" in Central Europe. We must now speak of another method, pursued in so-called "mixed ponds," in which there are fish of all ages, from 1 year to 8 to 10 years.

Not much can be said regarding this method, as there are no hatching and breeding ponds, but only one pond, which, however, must combine all the characteristics of the class-ponds. It must therefore have shallow places, overgrown with grass or aquatic plants (*Festuca fluitans* and *Phellandrium*), for the spawners and the young fish, and also places, 8 to 10 feet deep, for the larger fish. If such a pond is to yield some profit, it must also be particularly rich in food. A natural pond may be used, or, if such a one is not found, it may be artificially constructed. It is indispensable,

however, that such a pond should have the same depth of water all the year round, and it should be so arranged that even the last drop of water can be let off, as occasionally even the smallest fish, measuring only 2 to 3 inches in length, must be taken out. Such "mixed ponds" must likewise have "collectors" and "collector-ditches." It will also be found very useful to construct a sort of hatching-place, on some flat and sunny place, near the bank, *i. e.*, a so-called cut in the bank, measuring 40 to 100 feet in length and 30 to 50 feet in breadth, and having a depth of 5 inches to 1½ feet. This cut should be thickly planted with the above-mentioned aquatic plants, and ought, so to speak, to be the only place in the pond where carp can ascend from the depth in order to deposit their eggs conveniently and engage in the spawning process.

As soon as this has taken place, the entrance to this cut is closed with a net, so the eggs cannot be eaten by the fish. This net may be removed when the young fish have come out of the eggs, but it is preferable to leave it in its place for some days, that the young fish may be able to feed for some time undisturbedly.

FIG 1.



Explanation of diagram.—A is the pond, B the cut which, though directly connected with the pond, is in reality nothing but a hatching-pond, such as has been described above. In order to have a complete system of ponds, nothing would be required but a "breeding-pond."

In Europe this method was generally adopted by beginners in carp-culture, commencing with a mixed pond, and gradually proceeding to the small "hatching-pond," and finally to the "breeding-pond," as the great advantage of separate ponds for the different ages of fish over the "mixed-pond" system soon became evident.

In such a "mixed pond" no pike must be kept for regulating

the stock, as may be done in a class-pond, for all the small fish would then soon be devoured. It must be made a strict rule that, with the exception of the tench (*Cyprinus tinca*), no other kind of fish, however harmless, is allowed in the pond. The tench is related to the carp, but it spawns 4 to 5 weeks later, so there can be no danger of cross-breeds.

Great care should be taken that no goldfish (*Cyprinus carpio auratus*) or bream (*brama*) get in the pond, for these fish would soon mix with the carp and tend to degenerate the breed. Such fish should therefore be removed or killed at once. The goldfish, especially the milter, swims in spawning-schools like the carp, and at the very same season. It thus spoils the eggs of the carp, as all eggs which it impregnates will produce spotted fish, having at least a silvery streak $\frac{1}{4}$ to $\frac{1}{2}$ inch long and $\frac{1}{8}$ inch broad, between the caudal and the dorsal fin. Such bastards (the cross-breeds of goldfish and *Carassius* also resemble them) do not grow larger than goldfish, and have as many bones. They are unfit for table use and entirely unsuited for ornament, as they are neither genuine carp nor goldfish, and are disagreeable objects in the eyes of the scientist or connoisseur. If such fish are not removed immediately the consequence will be another cross-breed during the next spawning season, for such a hybrid spawns, like the goldfish, when it is a year old, and the breed of carps would degenerate still more. It is best to kill such worthless cross-breeds at once, as they are apt to give great trouble.

I would embrace this opportunity to impress upon every carp-culturist who intends to make breeding experiments with any carp procured through the United States Fish Commission, the importance of having if possible only *one* of three above-mentioned kinds of carp, unless he can have every kind in a separate pond. Thus, the common carp (*Cyprinus carpio communis*) should never be placed in the same pond with the "mirror carp" or the leather or naked carp" (*Cyprinus carpio alepidotus coriaceus vel nudus*), nor should the two last-mentioned varieties ever be in the same pond. Cross-breeds would invariably be produced, and in such a manner that one would have neither genuine common carps nor genuine mirror or leather carps, but a cross-breed of all the three varieties. Not even when quite young and not yet capable of spawning should these varieties be put together, because even if they are kept strictly separate during the spawning process, the young fish would never have the sharply-marked characteristics of their variety as regards form and color, but would approach nearer to the "mirror carp" and the "common carp." The carp has a striking tendency, when living with other varieties, to approach the

primitive form of the common carp, and finally to be merged in it. These beautiful varieties should therefore be kept strictly separate; lack of ponds or any other reason should never induce people to mix them.

If the breeding experiments are to be accompanied by good results, a pure variety should be selected, and the finest and best milters and spawners, showing strongly all the characteristics of their variety should be procured, and the experiments will be crowned with success.

I must return to the so-called "mixed culture," by mentioning that it is not to be recommended. In Central Europe it is never practised by scientific pisciculturists but only by small operators mostly in so-called "peasants' ponds." This method does never yield a certain and truly profitable result.

7.—FEEDING THE CARP.

In conclusion I will make some remarks on the feeding of carp in close ponds. It is not every natural pond which is a good pond, having the essentials of a good soil at the bottom and capable of producing sufficient food for the fish. If these conditions are wanting, the fish must be fed. This is as a general rule only necessary in ponds with sandy bottom without any clay. As I have said before, I am *not* in favor of feeding fish, as my standpoint is that of the rational culturist sharing the opinion with most of the prominent pisciculturists of the Old World, that the carp should find its own food in the ponds.

If, however, the nature of the bottom demands artificial feeding or if suitable food can be had at a remarkably cheap price, the feeding should be done with great caution. Never feed in one and the same place; even if the pond be very large, distribute the food in different places near the banks. If the food is always put in one place or even if it is distributed over two places, the carp will stay in the neighborhood of these places, will become languid, and instead of scouring the other parts of the pond in search of food, will remain at the bottom. It will, even if surrounded by the richest food, grow fat, but never have any firm flesh; nor will it ever grow much in length, as the somewhat phlegmatic fish does not get the exercise which favors its growth.

Never give them much food at one time, but by degrees, in small quantities, never during the day but either early in the morning or in the evening. During the hot season only feed them late at night, because the carp, if it has eaten sufficiently in the morning, will

remain at the bottom all day, while during the higher temperature of the water it is necessary for its health that it should swim round and get a change of water. It is therefore useful to place in ponds containing large carps a limited number of pike, which however, must be smaller than the carp. The carp fears the pike and flies from it. If there are pike in the pond, the carp will get more exercise and will seek natural feeding places, whither, on account of its innate sluggishness, it would never have gone.

Pond-carp are accustomed to other food than the river-carp. The former confine themselves to worms, larvæ, and plants, while those living in streams find all sorts of animal and vegetable refuse; these latter can also stand a greater amount of food, as the current naturally makes them take more exercise, thus increasing their appetite. It is different with the pond-carp; if you give it too much food, it will not take any more than is necessary to satisfy its hunger; the remnants will remain at the bottom, and if their quantity be considerable, they will spoil the water. If these remnants are chiefly animal refuse, as flesh or blood, fungi will grow on them, and will then produce, as with the salmon and trout, diseases of the skin, the gills, and in the case of the carp, sometimes internal diseases.

The writer once had the following experience: During his absence a number of large carp were fed on coagulated blood which had begun to putrefy; the fish devoured it eagerly, got sick, and most of them died in a few days from an inflammation of the intestines. Spoilt food should never be given to fish. If slaughter-house or kitchen refuse can be had, give these, chopped up small about the size of peas. Never give so much that remnants remain for any length of time in the water and begin to putrefy. Let no one be induced by the circumstance that the carps like to eat the dung of hogs, sheep and cows, to feed them on any putrefying matter. There are instances on record that thereby epidemics, particularly diseases of the scales have originated.

The carp likes above everything else vegetable matter, such as cabbage, lettuce, boiled potatoes, corn, turnips, pumpkins, melons, &c. The refuse of malt from breweries and distilleries, is also very good food for carp; and wherever such refuse can be had, it should be given to the fish.

The small pisciculturist, having a pond of perhaps 1-2 acres near his house, will often be able to feed his fish on refuse, as he will always have it fresh from the kitchen and stable.

In conclusion, I earnestly recommend the culture of the carp to all pisciculturists. If the value of the carp for table use has once

been recognized, it will become a highly esteemed fish, especially in the neighborhood of large and populous cities, and its culture will yield a larger and more certain profit, than the expensive trout.

8. — EXTENT OF CARP-CULTURE IN EUROPE.

In Europe many thousand acres of artificial waters are to be found. In these enormous quantities of carp are bred. Some of these ponds, or rather lakes, have an extent of about 1,000 to 2,000 acres. They are provided with gigantic dams, many of them 60 feet high. By these the water is closed in into broad valleys, containing no other fishes than carps from 4 to 5 pounds in weight. If we consider the size of these lake-like ponds, surrounded by enormous dams which are overgrown with oak-trees 100 to 300 years old, series of three and more of these lakes being not uncommon, then we can form some idea as to the remunerativeness of these establishments, particularly in Bohemia.

The standard establishment with regard to the most extensive business transactions is found in Austria. The Prince of Schwarzenberg, of whom I have spoken previously, possesses more than 250 ponds of large size, the smallest having about 10 acres, the largest 2,000 acres water extent.

We find many villages where ponds of 50 to 200 and more acres are maintained at the expense of the community.

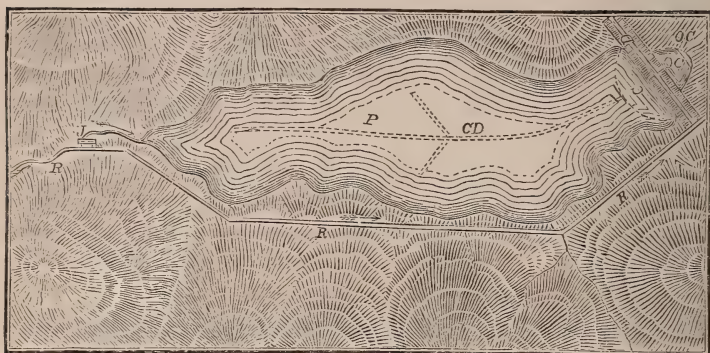
9. — THE TABLE QUALITIES.

If the carp were a fish of inferior quality, like the buffalo-fish, for instance, its sale would doubtless be limited to the seaport towns of Northern Germany and the principal cities of Central Europe, as Vienna, Berlin and Paris. In the latter city, in spite of an abundant supply of salt-water and different kinds of fresh-water fish, the carp is ever preferred to these, and with the exception of trout and salmon, it frequently commands a price three times as high as that of all the rest.

I maintain my assertion that the carp, whether it be scale, mirror, or leather carp, is one of the most excellent fresh-water fishes, and its introduction will be of great value in point of national economy, especially on account of the facility of its culture and the enormous extent to which this may be carried on.

The carp and its value as a fish of culture will before long be fully appreciated, so that we may be enabled favorably to compare the results of its culture in America, as also the extent attained to, with any other country, to our complete satisfaction.

FIG. 3.—Plan of a natural carp-pond.



Pond *P* is a natural body of water. Its extent is about one hundred and fifty to two hundred acres. It is formed by a dam, *D*, about seven to eight feet high, crossing the valley and thus collecting the water of a run flowing there. Before *D* is a deepening, *C*, the collector. In the dam *D* there is an outlet leading to another deepening — the so-called outlet collector *OC*. The purpose of this collector is to keep back fishes that may have passed the outlet when opened. It is provided with a screen or netting. *CD*, upon the bottom of pond *P*, is the collector-ditch, which conducts the fishes to *C* when the water is let out, and thus prevents them being caught in the mud. *R* is the run of water which, to prevent overflow, has to be conducted around the pond in a separate ditch, leaving an inlet at *I*, protected by a sluice with screens.

[D.]

LAWS AND RESOLVES, 1885.

[CHAP. 109.]

AN ACT relating to the Leasing of Great Ponds.

Be it enacted, etc., as follows :

SECTION 1. So much of chapter ninety-one of the Public Statutes, relating to inland fisheries, as authorizes the commissioners on inland fisheries to lease great ponds, is hereby repealed.

SECT. 2. This act shall take effect upon its passage. [*Approved March 27, 1885.*]

[CHAP. 209.]

AN ACT confirming the acts of the fish committee of the towns of Dennis and Yarmouth relating to the regulations of the Fisheries in Bass River.

Be it enacted, etc., as follows :

SECTION 1. The acts of the committee of the town of Dennis and the committee of the town of Yarmouth, acting as a fish committee under chapter thirty-seven of the acts of the year one thousand eight hundred and forty-nine, are hereby made valid and confirmed to the same extent as though the committee of the town of Dennis had been chosen annually instead of for the term of three years, and the said committee as now constituted shall continue to exercise the powers of fish committee under said chapter until their successors are chosen at the next annual town meetings in said respective towns.

SECT. 2. This act shall take effect upon its passage. [*Approved May 1, 1885.*]

[CHAP. 220.]

AN ACT relating to licenses to plant, grow and dig Oysters, and to the taking of Scallops.

Be it enacted, etc., as follows :

SECTION 1. No license shall be granted to plant, grow and dig oysters under sections ninety-seven, ninety-eight, ninety-nine, one hundred and one hundred and one of chapter ninety-one of the Public Statutes, and chapter two hundred and eighty-four of the acts of the year eighteen hundred and eighty-four, without a public

hearing upon the matter, due notice of which shall be given in writing, to be posted in three or more public places in the town in which the premises lie, at least seven days before the time fixed for such hearing.

SECT. 2. In case any person to whom such license shall be granted fails for two years thereafter to plant and grow oysters in the waters described in said license, the same shall be revoked by the officers who granted it, which revocation shall be recorded as provided in said section ninety-eight.

SECT. 3. Whoever takes in any one day, between sunrise and sunset, more than twenty-five bushels of scallops, including the shells, for each boat actually employed by him in taking the same, shall be punished by a fine not exceeding twenty dollars for each offence.

SECT. 4. Any person who at any time between the fifteenth day of April and the first day of September shall take scallops from any of the waters of the state by dredging, or by nets of any kind, or shall expose any scallops for sale within the state, or shall export the same, shall be punished by a fine not exceeding twenty dollars for each offence.

SECT. 5. Whoever works a dredge, oyster tongs or rakes, or any other implement for the taking of shell fish of any description, upon any oyster grounds or beds, other than public grounds or beds, without the consent of the licensee, lessee or owner thereof, or who shall, while upon or sailing over any such grounds or beds, cast, haul, or have overboard any such dredge, tongs, rake or other implement for the taking of shell fish of any description, under any pretence or for any purpose whatever, without the consent of the licensee, lessee, or owner, shall for the first offence be punished by a fine not exceeding twenty dollars or by imprisonment in jail not exceeding thirty days, and for every subsequent offence shall be punished by a fine not exceeding fifty dollars, or by imprisonment in the house of correction or jail not exceeding six months.

SECT. 6. The selectmen of any town or mayor and aldermen of any city may designate one or more constables for the detection and prosecution of any violation of the laws of the state relating to shell fisheries, within their respective jurisdictions. Each of said constables so designated may without warrant arrest any person found violating any of said laws, and detain him for prosecution not exceeding twenty-four hours, and may seize any boat or vessel used in such violation, together with her tackle, apparel and furniture, with all implements belonging thereto, which shall be forfeited to the use of the town or city in which such seizure is made. [*Approved May 11, 1885.*]

[CHAP. 245.]

AN ACT to amend the charter of the Lagoon Pond Company in Dukes County.

Be it enacted, etc., as follows :

SECTION 1. The Lagoon Pond Company in Dukes County, incorporated by chapter eighty-seven of the acts of the year eighteen hundred and fifty-seven for the purpose of creating a herring and perch fishery, is hereby authorized to use the pond above the dam at Long Point for the purpose of storing therein food fishes.

SECT. 2. Said corporation shall during the occupancy of said pond for storing food fishes be required to post notices of the fact of such occupancy on the shores of said pond ; and during such occupancy said corporation and its agents shall have the exclusive right to take fish therefrom, except that any person may spear eels or dig clams therefrom.

SECT. 3. Whoever without leave from said corporation, during the occupancy of said pond for storing food fishes, takes fish therefrom, except as provided in section two of this act, shall be punished by a fine of not less than five nor more fifty dollars.

SECT. 4. Trial justices may enforce the penalties provided by this act. [Approved May 21, 1885.]

[CHAP. 247.]

AN ACT to repeal An Act for the protection of Striped Bass and Bluefish in the waters of Edgartown.

Be it enacted, etc., as follows :

SECTION 1. Chapter sixty-five of the acts of the year eighteen hundred and eighty-two is hereby repealed and no penalty shall hereafter be enforced for its violation.

SECT. 2. This act shall take effect upon its passage. [Approved May 22, 1885.]

[CHAP. 256.]

AN ACT providing for the enforcement of an act for the protection of Lobsters.

Be it enacted, etc., as follows :

SECTION 1. For the purpose of enforcing the provisions of chapter two hundred and twelve of the acts of the year eighteen hundred and eighty-four, relative to the protection of lobsters, either of the commissioners on inland fisheries, personally or by deputy, or any member of the district police detailed by the governor as provided in said chapter, may search in suspected places for, seize and remove, lobsters taken, held or offered for sale in violation of the provisions of said chapter.

SECT. 2. This act shall take effect upon its passage. [Approved May 22, 1885.]

[E.]

TABLES SHOWING

RETURNS OF WEIRS, SEINES AND GILL-NETS.

TABLE I. — POUNDS AND WEIRS. — Showing the Catch of each during 1885.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Spanish Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fish.	Eels.	Other Edible Fish.
Manchester,	John G. Heath,	-	-	106,256	-	-	507	-	32,409	-	-	-	80	-	-
"	Jones Bros. & West,	-	-	158,960	-	-	-	-	56,863	-	-	-	-	-	-
Nahant,	Long Point Weir Co.,	-	9,341	295,520	-	-	-	-	189,447	-	-	28	403	-	-
Plymouth,	J. J. Nye,	-	12,643	-	39	-	4,797	48	12	1	2	849	372	141	-
Dennis,	Crowell Weir Co.,	90	4,860	-	-	-	20	-	50,653	-	135	149	189	6	-
"	Sears Bros.,	20	-	-	-	-	-	-	59,511	-	7	-	-	-	-
Brewster,	Freeman Atwood & Son,	10	-	-	3	-	-	-	31,709	-	128	116	15	-	-
"	James Eldridge,	-	1,200	-	-	-	-	-	6,143	-	14	-	-	-	-
"	Z. H. Rogers,	-	-	-	-	-	-	-	9,684	-	33	4	-	-	-
West Brewster,	J. H. Newcomb,	147	3,425	-	-	-	-	-	59,223	-	-	-	62	1,301	-
Wellsfleet,	W. P. Doane,	-	-	-	-	-	-	-	2,600	-	166	-	-	-	-
Truro,	Atkins, Hughes and others,	61	-	1,354,180	-	-	-	-	707,095	-	1,569	1,182	138,735	-	-
"	P. L. Paine & Co.,	560	23,322	185,410	1	-	25	-	292,546	-	666	150	15,143	-	1,501
"	N. K. Parsons,	59	12,411	603,655	226	-	138	-	52,093	-	329	174	4,242	103	55
Provincetown,	D. W. Atwood,	-	157,100	24,565	2	-	5	-	23,437	-	171	3	-	-	-
"	Solomon Bangs,	5	170	598,536	-	2	8	-	26,381	-	9	6	2,862	-	5,001
"	Henry J. Lewis,*	-	-	62,590	-	-	-	-	30,536	-	37	-	10,915	-	-

TABLE I.—POUNDS AND WEIRS.—Continued.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alwives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Spanish Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fish.	Beils.	Other Edible Fish.
Gosnold,	Alonzo B. Veeder, . . .	7	-	-	-	-	95,600	4,914	473	-	479	270	5,600	-	20,030
"	Frederick A. Veeder, . .	3	1,150	975	-	-	118,550	848	442	-	132	1,205	3,738	-	-
Fairhaven,	J. C. & J. J. Allen, . . .	-	5,952	-	12	-	2,692	15	-	-	1	1,175	528	-	1
"	Daniel W. Deane, . . .	18	62,763	-	259	76	9,250	142	2	1	146	15,957	7,069	1,754	-
"	George R. Deane, . . .	5	18,069	-	110	7	2,296	16	19	-	7	904	1,047	56	-
"	Samuel P. Dunn, . . .	1	15,791	-	705	-	11,918	127	1	-	4	3,366	1,533	540	-
"	Hiller, Gamons & Co., . .	13	44,533	-	-	5	7,788	108	12	-	79	4,150	3,452	7	-
"	Matthew Merry, . . .	2	2,939	-	-	-	130	5	-	-	2	11	57	-	-
"	Ebenezer Mott, . . .	5	12,950	-	84	2	1,295	42	37	-	14	19	618	30	3,918
"	C. H. Pease & Co., . . .	13	24,139	-	-	9	24,318	348	48	-	135	3,216	8,820	1	-
"	R. W. Pease, . . .	13	5,775	-	-	35	9,100	80	-	1	75	674	1,172	-	-
"	D. C. Potter, . . .	1	7,238	-	-	7	171	12	-	-	7	159	943	99	-
"	Joseph P. Rose, . . .	-	-	-	-	14	1,249	12	-	-	6	396	667	-	-
"	Charles D. Sherman, . . .	23	18,688	20	191	20	1,616	264	-	-	145	28	3,356	38	6,251
"	George R. Wixon, . . .	-	5,138	-	-	3	1,872	26	-	-	179	26	420	58	41
"	George R. Wixon & Co., .	8	16,124	-	25	15	2,423	159	1	4	91	2,249	1,191	162	88
Dartmouth,	Joseph F. Briggs, . . .	103	25,876	2	124	234	1,918	244	1	-	202	817	3,744	4	60

"	"	Manchester & Allen,	.	.	581	57,327	-	37	4	4,832	66	291	-	5	928	568	-	-
"	"	George Prialux,	.	.	59	27,707	-	618	14	18,165	357	12	1	19	1,295	6,049	12	138
"	"	Benjamin Queripel,	.	.	-	91,507	-	-	-	106,635	160	-	-	415	604	4,393	-	-
"	"	George A. Snell,	.	.	412	80,608	71	2,075	28	31,303	610	169	2	399	466	7,251	-	11,729
"	"	Jonas Travers,	.	.	111	5,400	16,745	80	3	5,620	249	60	-	217	147	2,979	1	-
South Dartmouth,	.	Nicholas Prialux,	.	.	15	-	12,975	1,028	3	2,283	251	-	-	174	857	1,299	21	-
Chilmark,	.	Richard Flanders & Co.,	.	.	-	7,191	-	-	-	25,508	669	333	-	3	-	1,385	-	4,465
"	"	H. O. Poole & Co.,	.	.	42	20,400	1,100	-	-	49,927	133	830	-	86	76	7,343	-	-
Tisbury,	.	E. S. W. D. Cleveland,	.	.	-	-	3,294	-	2	785	475	3	-	-	-	2,593	-	-
Vineyard Haven,	.	C. F. Cleveland,	.	.	5	10,117	40	4	6	493	78	12	2	3	145	1,084	4	-
		Total,	.	.	17,330	943,078	6,266,220	5,667	587	1,167,975	14,092	1,893,639	13	12,539	45,503	295,647	4,366	89,984

[Additional returns on next page.]

TABLE I. — Pounds and Weirs — Concluded. Additional Returns.

TOWN OR PLACE.	PROPRIETOR.	Shad	Alwives.	Sea Herring.	Menhaden.	Striped Bass.	Sculp.	Squeteague.	Mackerel.	Spanish Mackerel.	Bluefish.	Tautog.	Flounders and Flat Fish.	Eels.	Other Edible Fish.
Plymouth, .	W. S. Hadaway,	84	-	1,812	-	-	154	-	429,472	-	1,131	482	-	1	24,000
Sandwich, .	T. L. Mayo & Co.,	-	-	-	-	-	-	-	54,322	-	-	-	110	-	8,030
Dennis, .	E. C. Matthews,	-	-	-	-	335	-	57	6,139	-	115	14	-	-	-
"	Nobscusset Fish Wier Co.,	-	-	650	-	-	-	-	42,050	-	929	391	-	-	-
East Dennis,	Anthony T. Chase,	-	-	-	-	-	-	-	137,331	-	9,075	-	-	-	-
Brewster, .	Nels Nelson,	-	-	-	-	-	-	-	7,150	-	-	-	-	-	-
Wellfleet, .	J. H. Horton,	-	-	7,200	-	-	-	-	2,500	-	-	2	10,800	374	-
Provincetown,	Isaac B. Lewis,	10	1,380	-	-	1	-	-	34,700	-	2,911	-	-	-	-
Eastham, .	Philip Smith,	-	-	-	-	-	-	-	18,300	-	1,605	-	-	3,000	-
"	O. W. Horton,	-	-	285,000	-	-	-	-	8,450	-	2,427	-	4,100	-	-
"	James Savage,	50	-	-	8	6	53,350	15	3,733	-	71	177	260	-	54
Palmouth, .	Prince M. Stuart,	-	-	330	580	381	4,264	2,945	-	11	1,374	233	4,832	-	134
Dartmouth, .	Waite & Smith,	484	108,620	-	-	-	2,769	40	109	-	36	323	22	-	6,496
Westport, .	William W. Whalon,	22	13,070	-	-	-	12,118	597	3,685	-	362	106	1,411	-	-
Tisbury, .	Obed S. Daggett,	58	-	3,407	-	55	-	-	-	-	-	-	-	-	-
"	Total,	758	123,070	298,399	588	778	72,655	3,654	749,551	11	20,036	1,728	21,535	3,375	38,714
"	Total from page 73, .	17,330	943,078	6,266,220	5,667	587	1,167,975	14,092	1,893,639	13	12,539	45,503	295,547	4,366	89,984
"	Grand Total,	18,088	1,066,148	6,564,619	6,255	1,365	1,240,630	17,746	2,643,190	24	32,575	47,231	317,082	7,741	128,698

TABLE II. — SALT-WATER SEINES. — Showing the Catch of each during 1885.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alwives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Spanish Mackerel.	Bluefish.	Tautog.	Flounders and Flatfish.	Eels.	Other Edible Fish.
Newburyport, .	Charles A. Caswell, .	•	10,004	•	•	1	•	•	•	•	144	•	•	•	•
South Yarmouth, .	David S. Baker, .	•	15,350	•	•	•	•	•	•	•	220	•	•	•	•
“	Hiram E. Baker, .	•	20,325	•	•	•	•	•	•	•	•	•	340	•	•
West Dennis, .	Sylvester Baker, .	•	1,197	•	•	•	•	•	•	•	•	•	•	•	•
Chatham, .	Horatio Howes, .	•	•	•	•	•	•	•	•	•	85	•	•	•	•
Mashpee, .	David Lovell, .	•	3,825	•	•	156	•	•	•	•	147	•	81	•	95
Westport, .	Samuel G. Allen, .	•	7,239	•	7	29	65	•	•	•	•	•	2	27	119
“	Perry Kirby, .	•	2,950	•	•	36	•	•	•	•	•	•	214	231	398
“	J. T. Lawton, .	•	5,682	•	•	2	•	•	•	•	•	3	•	61	•
“	T. B. Pierce, .	•	7,535	•	•	11	•	•	•	•	•	•	25	124	•
“	Lysander W. White, .	•	3,367	•	•	•	•	•	•	•	•	•	•	9	•
South Westport, .	C. F. Hitt, .	•	2,556	•	•	•	•	•	•	•	•	•	496	16	•
“	Leonard M. Sanford, .	•	6,771	•	•	•	•	•	775	•	•	•	•	•	205
“	Charles A. Tripp, .	•	2,682	•	•	•	•	•	•	•	•	•	17	9	•
“	Philip S. Tripp, .	•	7,588	5	37	36	•	•	•	•	•	•	212	265	•
South Dartmouth, .	John Medreass, .	•	12,924	2,555	•	14	25,599	615	21	•	28	•	3,168	•	•
Barnstable, .	David Rogers, .	•	•	•	•	•	•	•	•	•	1,229	•	•	•	•
Osterville, .	H. & J. Crosby & Co., .	•	•	•	•	•	676	•	•	•	4,782	•	•	22	•
Marion, .	E. E. Hammond, .	•	•	15	•	•	•	•	•	•	•	•	•	•	•
	Total,	434	109,995	2,575	44	288	26,340	615	796	•	6,635	3	4,555	814	817

TABLE III. — GILL-NETS. — Showing the Catch of each during 1885.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fish.	Reels.	Other Edible Fish.
Barnstable,	Stephen H. Crawford,	.	.	.	.	.	232	.	.	399	1	.	.	.
"	H. F. Kelley,	.	.	.	.	.	.	.	.	2,130	.	.	.	.
"	J. D. Kelley,	.	.	.	.	.	.	.	.	983	.	.	.	.
"	Moses Sturges,	.	.	.	.	.	.	.	.	1,755	.	.	.	.
Centreville,	Charles E. Bearse,	.	.	.	.	.	.	.	.	5,654	.	.	.	.
"	William H. Hallett,	.	.	.	.	.	.	.	.	5,726	.	.	.	4,517
"	Benjamin Lewis,	.	.	.	.	.	.	.	.	2,364	.	.	.	.
Dennis,	Zenas H. Baker,	.	.	.	.	.	.	1	287	1,752	14	73	5	120
"	Venez Kelley,	.	.	.	.	.	.	.	.	158	.	.	.	.
Wellfleet,	W. F. Pierce,*	.	.	9,000	.	.	.	.	418	4,814	.	.	.	.
"	Hermann F. Rogers,	.	.	.	.	.	.	.	.	6,200	.	.	.	.
North Truro,	Benjamin Coan,	.	.	.	.	.	.	.	.	725	.	.	.	.
"	Caleb M. Grozier,	.	.	.	.	.	.	.	404	525	.	.	.	.
Provincetown,	John Atkins,	.	.	.	.	.	.	.	.	10,838	.	.	.	.
"	Paul L. Bangs,	.	.	4,601	.	.	.	.	15,701	429	6	9,263	.	.
"	Joseph M. Caton,	.	.	3,950	.	.	.	.	2,870	332	.	.	.	.

* June 23, 63 Spanish mackerel.

[illegible]

TABLE III. — GILL-NETS — Continued.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fish.	Eels.	Other Edible Fish.
Fairhaven,	John C. Allen & Co.,	.	.	.	34	.	243	12	1	510	7	.	.	.
"	Daniel W. Deane,	.	.	.	5	.	38	18	.	644	.	.	.	.
"	D. C. Potter,	.	.	.	.	.	.	.	.	150	.	.	.	.
Westport,	J. O. Babbitt,	.	.	4,000	.	117	.	.	.	1,552	200	.	.	.
"	Horace B. Cash,	.	.	.	.	.	.	.	.	743	.	.	.	.
Nantucket,	W. I. Fisher,	.	.	.	.	.	.	.	.	901	.	.	.	.
"	R. W. Paine,	.	.	.	.	.	.	.	.	503	.	.	.	.
"	Warren F. Ramsdell,	.	.	.	.	.	.	.	.	2,081	.	.	.	.
"	Charles E. Snow,	.	.	.	.	.	1	.	.	270	.	1	.	.
		10	7,679	79,576	6,420	213	514	1,041	168,786	79,423	230	26,393	153	4,637

[See next page for additional returns.]

TABLE III. — GILL-NETS — Concluded. *Additional Returns.*

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alwives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fish.	Eels.	Other Edible Fish.
Barnstable, . . .	W. F. Carney, . . .	-	-	-	-	-	-	-	-	4,666	-	-	-	-
Dennis, . . .	Joshua Pierce, . . .	-	-	-	-	-	-	-	-	2,116	-	-	-	-
North Truro, . . .	Richard S. Chandler, . . .	-	-	-	-	-	-	-	1,200	1,400	-	-	-	-
Provincetown, . . .	E. Q. Weeks, . . .	-	-	-	-	-	-	-	800	622	-	-	-	-
" . . .	Isaac Tyler, . . .	-	-	-	3,082	-	-	-	-	701	-	-	-	-
" . . .	John Freeman, . . .	-	-	-	-	-	-	-	-	240	-	-	-	-
" . . .	George W. Freeman, . . .	-	-	-	-	-	-	-	9,097	150	-	-	-	-
Eastham, . . .	J. Q. Hopkins, . . .	-	-	-	-	-	-	-	-	4,459	-	-	-	-
Chatham, . . .	Jesse Gill, . . .	-	-	-	-	-	-	-	1,687	-	-	-	-	-
Nantucket, . . .	Charles K. Manter, . . .	-	-	-	-	-	-	-	790	531	-	-	-	1*
" . . .	A. H. Adams, . . .	-	-	-	-	-	-	-	-	191	-	-	-	-
Marion, . . .	George E. Leonard, . . .	-	-	-	-	-	-	-	-	15,313	-	-	-	1
	Total, . . .	-	-	-	3,082	-	-	-	13,574	79,423	-	-	-	4,637
	Total from page 78, . . .	10	7,679	79,576	6,420	213	514	1,041	163,786	230	26,393	153	4,638	
	Grand Total, . . .	10	7,679	79,576	9,502	213	514	1,041	182,360	230	26,393	153	4,638	

* Spanish mackerel.

TABLE IV. — CONNECTICUT RIVER SEINES.

TOWN OR PLACE.	PROPRIETOR.	Shad.
South Hadley, . . .	C. C. Smith and others,	1,718
	Total,	1,718

TABLE V. — MERRIMAC RIVER SEINES.

TOWN OR PLACE.	PROPRIETOR.	Shad.
Amesbury,	Jonathan Morrill,	86
North Andover,	Eben Sutton,	44
	Total,	130

TABLE VI. — TAUNTON RIVER SEINES.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Striped Bass.
Raynham,	Gustavus King,	840	183,241	-
"	G. B. & E. Williams,	597	196,740	-
Dighton,	Charles N. Simmons,	80	150,000	-
"	E. & O. Buffinton,	400	80,000	-
Taunton,	J. W. Hart & Co.,	365	101,535	-
Berkley,	Isaac N. Babbitt,	571	125,323	-
"	Edmund Hathaway,	540	153,088	15
"	William H. Walker,	400	90,000	-
"	Nichols & Shove,	450	170,000	-
Somerset,	George H. Simmons,	1	17,552	-
	Total,	4,964	1,267,479	15

TABLE VII.—OTHER FRESH-WATER SEINES AND DIP-NET FISHERIES.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Striped Bass.	Frostfish.
West Medford, . . .	Cross Bros.,	-	170,100	-	-
Weymouth,	Weymouth Iron Co.,	-	75,275	-	-
Hingham,	Thomas Weston,	-	3,008	-	-
Kingston,	Philander Cobb,	-	10,500	-	-
Plymouth,	E. & J. C. Barnes,	-	53,832	-	-
“	Rogers & Phinney,	3	14,279	-	-
Yarmouth,	Long Pond Fishing Co.,	-	15,194	-	-
West Brewster, . . .	J. Howard Winslow,	-	129,082	-	-
Wellfleet,	Winslow Paine,	-	265,018	-	-
Wareham,	George Sanford,	-	279,600	-	-
Mattapoisett, . . . .	. . . . .	-	-	-	-
Marion and Rochester,	A. H. Shurtleff,	-	275,937	-	-
Chilmark,	Estate H. M. Smith,	-	4,624	-	-
	Total,	3	1,296,449	-	-

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REPORT

OF THE

FISH AND GAME COMMISSIONERS

OF

MASSACHUSETTS

FOR THE YEAR ENDING DECEMBER 31, 1886.

BOSTON :
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Commonwealth of Massachusetts.

To His Excellency the Governor and Honorable Council.

The Fish and Game Commissioners respectfully present their Twenty-first Annual Report : —

FISHWAYS.

There have been no complaints as to the working of the fishways, and only two applications for the construction of new ones.

Below will be found Mr. Holmes's report on the Lawrence fishway : —

LAWRENCE, Nov. 23, 1886.

E. A. BRACKETT, *Commissioner on Fisheries.*

DEAR SIR : — I enclose my report of the Lawrence fishway for this year. I do not think that the run of salmon has been as large as was expected, although they showed up very well in the fall, and very late too.

The run of lamper eels was the largest I have seen since the fishway came under my charge. I do not think the alewives came up to last year. Perhaps if screens could be put in at the head of the canals, so that salmon and alewives could not get into them, it would be an advantage. As the river is now, when the water is low the fish are disposed to follow the current down the canal, and in ascending in the spring are attracted by the outflow at the foot of the canal, and sometimes in the swift current dash themselves against the sides of the wheel-pit. The time may come when it would be desirable to adopt some means for keeping the fish out of these places. I have heard of two or three salmon being killed in the wheel-pits after the mills were shut down.

If Andover, or some other town, could be induced to put alewives into a large pond connected with the river, not only would the alewives be increased, but the fisheries of the pond would be benefited. Haggett's would be a good one for that purpose.

Mr. Knowles repaired the fishway this season, and it is in better condition to stand the spring freshets than it has ever been.

Yours truly, THOMAS S. HOLMES.

FISH IN THE LAWRENCE FISHWAY IN 1886.

- May
1. A few lampreys and alewives.
 2. Lampreys, alewives and suckers, run small.
 3. Lampreys, alewives and suckers, run small.
 4. Lampreys, alewives and suckers, run small.
 5. Lampreys, alewives and suckers, run small.
 6. Lampreys, alewives and suckers, run small.
 7. Lampreys, run moderate; alewives and suckers, run small.
 8. Lampreys, run moderate; alewives and suckers, run small.
 9. Lampreys, run moderate; alewives and suckers, run small.
 10. Lampreys, run small; a few alewives and suckers.
 11. Lampreys, alewives and suckers, run small.
 12. Lampreys, alewives and suckers, run small.
 13. Lampreys, alewives and suckers, run small.
 14. Lampreys, alewives and suckers, run moderate.
 15. Lampreys, alewives and suckers, run moderate.
 16. Lampreys, run moderate; alewives, run small.
 17. Lampreys, run moderate; alewives and suckers, run small.
 18. Lampreys and suckers, run moderate; alewives, run small.
 19. Lampreys, alewives and suckers, run moderate.
 20. Lampreys and suckers, run moderate; alewives, run small.
 21. Lampreys and suckers, run moderate; alewives, run small.
 22. Lampreys, alewives and suckers, run moderate.
 23. Lampreys, run large; alewives and suckers, run moderate.
 24. Lampreys, run very large; alewives and suckers, run large.
 25. Lampreys, run very large; alewives, suckers and redfin shiners, run large.
 26. Lampreys, run very large; suckers and alewives, run moderate.
 27. Lampreys, run large; alewives and suckers, run moderate.
 28. Lampreys, run large; alewives and suckers, run moderate.
 29. Lampreys, run moderate; alewives and suckers, run small.
 30. Lampreys, run large; suckers, run moderate; alewives, run small.
 31. Lampreys and suckers, run large; alewives, run small.
- June
1. Lampreys, run large; suckers, run moderate; alewives, run small.
 2. Lampreys, run very large; suckers, run moderate; alewives, run small.
 3. Lampreys and suckers, run large; alewives, run small.

- June 4. Lampreys, run large; suckers, run moderate; alewives, run small.
5. Lampreys, run large; suckers and alewives, run small.
6. Lampreys, run large; suckers, run moderate; alewives, run small.
7. Lampreys, run large; suckers and alewives, run small.
8. Lampreys, run moderate; suckers and alewives, run small.
9. Lampreys, run moderate; suckers and alewives, run small.
10. *One salmon*, 12 pounds; lampreys and suckers, run moderate; alewives, run small.
11. Lampreys, run moderate; suckers and alewives, run small.
12. Lampreys, run moderate; suckers, run small.
13. Lampreys, run moderate; suckers and alewives, run small.
14. Lampreys, run moderate; suckers, run small.
15. Lampreys and suckers, run moderate.
16. Lampreys and suckers, run moderate.
17. Lampreys and suckers, run moderate.
18. Lampreys, run moderate; suckers and alewives, run small.
19. Lampreys and suckers, run moderate; alewives, run small.
20. *Two salmon*, 10 to 12 pounds; lampreys and suckers, run moderate.
21. Lampreys and suckers, run moderate; alewives, run small.
22. *Two salmon*, 12 to 14 pounds; lampreys and suckers, run moderate.
23. Lampreys and suckers, run moderate; a few alewives.
24. *Two salmon*, 10 to 12 pounds; lampreys and suckers, run small.
25. Lampreys and suckers, run moderate.
26. Lampreys and suckers, run moderate.
27. Lampreys and suckers, run moderate.
28. Lampreys and suckers, run small.
29. Lampreys and suckers, run moderate.
30. Lampreys and suckers, run small.

The water kept getting lower every day after the 1st of July, and the fish seen were less and less, and on July 12 I shut the water out of the fishway, as there was no water running over the dam, and only a few suckers in the way. The water was low all through the latter part of July, the month of August and half of September; water shut out of fishway nearly all the time, except Sundays. The fish seen were a few suckers and small silver eels in August and September. The river commenced to rise about September 17, and I let the water into the fishway on the 18th. Suckers appeared on the 19th, and I saw salmon as below:—

- Sept. 21. *One salmon*, 8 pounds.
26. *Two salmon*, 8 to 12 pounds.
28. *One salmon*, 14 pounds.

Oct. 5. Two salmon, 6 to 8 pounds.

Water was shut out of fishway again from October 10 to October 31, and on November 4 I saw one salmon, 8 pounds, since which time I have seen no fish.

Yours respectfully, THOMAS S. HOLMES.

THE LOWER PART OF THE MERRIMAC.

What is known by the fishermen at Newburyport as *bait*, consisting mainly of blue-backs and menhaden, have become very scarce at the mouth of the Merrimac. The menhaden, which were so plenty in our bays years ago, appear in many cases to have entirely deserted them.

The theory that no amount of fishing could materially lessen the deep-sea fisheries appears to be losing ground, and the intelligent fishermen are earnestly struggling for a law to protect the mackerel during their spawning season. With the driving away or destruction of the menhaden, the blue-fish are decreasing on our coast.

If the New England States had combined and protected the menhaden in their bays and estuaries they would probably have added millions of dollars to the value of our in-shore fisheries. They furnished an immense amount of food to more valuable fish, for where their food is will be found all animal life.

In no other industry has there been such a reckless disregard of common sense as has marked the course of most of our fishermen, and it is gratifying to know that a decided change for the better is taking place among many of them.

The misfortune is that they do not awaken to the danger that threatens them until the injury is done. The most ignorant farmer knows that there is a limit to the production of his farm, no matter how many acres he may possess; and with the improved methods of fishing there is a limit to the catch of fish, no matter how large the feeding grounds may be.

NEWBURYPORT, MASS., Nov. 22d, 1886.

To the Commissioners on Inland Fisheries.

GENTLEMEN:—I have the pleasure herewith to submit to you my report for the present season:—

Fish called bait have been very scarce in the Merrimac this season, not more than thirty-five barrels having been taken; it is at least twenty-five years since they have been so scarce.

In regard to dead salmon, I would say that in my rounds during the season I have seen but one, and that on the river near Haverhill.

In the matter of violation of the law in relation to lobsters, I desire to say that warrants have been issued against the following: John Low of Haverhill, Mass., who disappeared before the warrant could be served, and who has not since been seen; also, Ambrose A. Pike of Newburyport and Albert Reed of Haverhill; Pike and Reed were both arraigned, found guilty and fined in the police court at Newburyport. Their offence consisted in the following: Reed, for catching at Ipswich; Pike, for having in his possession at Salisbury Point; and Low, for selling at Haverhill.

In regard to game, gunners appear to be well pleased with the appointment of a game warden. A larger number of quail have been seen this year than for several years past. It is the opinion of gunners hereabouts, as well as my opinion, that the law relating to quail and partridge should come into operation at the same time, as tending to prevent the present confusion of dates and accidental violation of the law, which it is plain may naturally and honestly occur by lapse of memory and otherwise.

I have the pleasure, gentlemen, to remain your obedient servant,

EDWIN F. HUNT, *Deputy Commissioner.*

SHAD HATCHING ON THE MERRIMAC.

Shad hatching was continued at North Andover during the past season with satisfactory results, and if it can be still continued and present regulations maintained along the river, especially at the mouth, success is certain, for artificial hatching as a means of restoring the fish to a river is no longer an experiment.

The repeated assertions that the impurities of the water of the Merrimac are destructive to the fish have little foundation in fact, but there can be no question that the use of small mesh-nets on the lower part of the river had

much to do with the depletion of the fisheries. Even the present arrangements, which were a compromise, destroy many immature shad.

But little was done on the lower part of the river, and the fishermen on the upper part generally abstained from fishing, thereby aiding the Commissioners in their efforts to re-stock the river.

To the Commissioners on Inland Fisheries.

GENTLEMEN:—We respectfully submit the following report, giving the full details of the work of hatching shad at North Andover during the season of 1886. The hatchery was opened June 7, and closed July 14.

Number of large shad taken,	644
of small shad taken,	1,030
of shad returned to river alive,	1,469
of shad given away,	205
of salmon taken,	6
of salmon returned to river alive,	6

Of the 644 large shad taken, 205 male and female fish were used for spawning. The estimated amount of spawn taken was 695,000.* The number of shad hatched was fully 600,000; these were turned into the river at North Andover as soon as hatched.

There was a decided increase in the run of fish this season, as will be seen by the table,—40 full-grown shad were taken at one sweep on the evening of June 9; the oldest fishermen here said they had seen nothing like that for fifteen years. The run of fish continued up to July 8. Only 6 salmon were taken; these were returned to the river. The taking of so few salmon was accounted for by the fishermen from the fact that the river was high in the month of June, and the salmon found no difficulty in going over the falls.

The following table will show the number of large shad taken each day, the proportion of males to females, the temperature of the water and air at 7 o'clock P. M., the time of drawing the seine, also the number of fish taken at each sweep.

* This estimate is too low; a full-size female shad will give from 30,000 to 40,000 eggs. Allowing one-third of the fish to have been females, the estimate should not have been less than *two millions*.

1886.	Number of Fish Taken.	Males.	Females.	Temperature of Water at 7 p. m.	Temperature of Air at 7 p. m.	Time of Drawing Seine.	No. of Fish per Sweep.
June 7,	3	0	3	70	68	8, 9, P. M.	0, 3
8,	12	8	4	70	69	7, 8,	0, 12
9,	40	30	10	70	72	7, 8,	0, 40
10,	61	51	10	72	70	7, 8,	30, 31
11,	32	24	8	73	68	8, 9,	7, 25
12,	32	19	13	70	68	8, 9,	20, 12
14,	17	10	7	68	60	8, 9,	7, 10
15,	15	8	7	66	60	8, 9,	7, 8
16,	25	16	9	68	68	7, 8,	15, 10
17,	14	8	6	70	70	8, 9,	14, 0
18,	37	33	4	70	55	8, 9,	15, 22
19,	15	8	7	70	64	8, 9,	6, 9
21,	28	20	8	72	66	7, 8,	12, 16
22,	32	23	9	74	64	8, 9,	15, 17
23,	26	18	8	71	65	8, 9,	15, 11
24,	10	5	5	72	68	7, 8,	4, 6
25,	28	18	10	73	69	8, 9,	10, 18
26,	3	3	0	71	67	8, 9,	3, 0
28,	27	18	9	72	64	7, 8,	15, 12
29,	23	15	8	74	66	8, 9,	15, 8
30,	24	17	7	74	58	9, 10,	12, 12
July 1,	27	15	12	75	62	8, 9,	12, 15
2,	15	5	10	75	68	9, 10,	4, 11
3,	12	8	4	76	68	9, 10,	8, 4
6,	20	5	15	78	70	9, 10,	8, 12
7,	19	7	12	78	78	8, 9,	10, 9
8,	16	5	11	80	70	9, 10,	6, 10
9,	13	5	8	82	68	9, 10,	5, 8
10,	3	0	3	78	66	8, 9,	0, 3
12,	10	0	10	77	58	9, 10,	9, 1
13,	1	0	1	74	60	8, 10,	1, 0
14,	4	0	4	73	60	9, 10,	2, 2

When we consider the low state to which the shad fisheries of the Merrimac had been reduced in 1881, our expectations from the results of hatching shad have thus far been fully realized, and there are good reasons for expecting a much larger increase of fish in 1887. One of the great evils to the propagation of shad in the Merrimac has been effectually stopped, which was the using of so many fine mesh seines at the mouth of the river. There are other obstacles, however, which seem to be beyond our control; the river is actually swarming with minnows, red perch, chubbs, frogs and suckers, all of which feed upon the spawn of fish in the spawning season. The suckers would gather around the hatching boxes, turn upon their backs and suck the spawn through the wire. This trouble

can be avoided by placing an extra wire two inches below the wire on the bottom of the hatching boxes. During the fishing season, hundreds of suckers were taken and destroyed, and yet at the close of the season they seemed to be just as numerous.

Respectfully yours, B. P. CHADWICK.
ROBT. ELLIOT.

TROUT. (*Salmo fontinalis*.)

We received from the works at Plymouth, N. H., last year, 250,000* eggs of these fish, which was double the number received in 1885, and this year there will be something over 350,000.

These eggs were hatched with only about two per cent. loss, and were distributed approximately as follows:—

E. G. Loomis,	.	.	.	Bedford,	.	.	.	5,000
Chas. M. Jenks,	.	.	.	Bedford,	.	.	.	5,000
G. W. Morse,	.	.	.	Newton,	.	.	.	5,000
Chas. N. Foote,	.	.	.	Lee,	.	.	.	10,000
J. B. Peck,	.	.	.	North Attleborough,	.	.	.	5,000
N. D. Gay,	.	.	.	Springfield,	.	.	.	5,000
W. H. Abbott,	.	.	.	South Easton,	.	.	.	5,000
F. L. Cushman,	.	.	.	Springfield,	.	.	.	5,000
Miles Sampson,	.	.	.	Pembroke,	.	.	.	5,000
O. F. Hoyle,	.	.	.	Worcester,	.	.	.	5,000
Daniel Gay,	.	.	.	Great Barrington,	.	.	.	5,000
E. H. Lathrop,	.	.	.	Springfield,	.	.	.	25,000
Eben Sutton,	.	.	.	North Andover,	.	.	.	5,000
John H. Sutton,	.	.	.	North Andover,	.	.	.	5,000
R. E. Bemus,	.	.	.	Chicopee,	.	.	.	5,000
B. T. Hillman,	.	.	.	Edgartown,	.	.	.	5,000
Amoz Smith,	.	.	.	Edgartown,	.	.	.	5,000
W. H. Little,	.	.	.	Sheffield,	.	.	.	5,000
H. Everett Lake,	.	.	.	Topsfield,	.	.	.	5,000
John B. Loring,	.	.	.	Cape Cod,	.	.	.	10,000
A. L. Plympton,	.	.	.	Roxbury,	.	.	.	5,000
A. G. Sharp,	.	.	.	Richmond,	.	.	.	5,000
John E. Sawyer,	.	.	.	Methuen,	.	.	.	3,000
Wm. Ticknor (for Club),	.	.	.	Great Barrington,	.	.	.	10,000
Henry R. Peirson,	.	.	.	Pittsfield,	.	.	.	5,000
C V. Dudley,	.	.	.	Whitinsville,	.	.	.	5,000
N. F. Mayo,	.	.	.	Cliftondale,	.	.	.	3,500
Parker D. Hubbard,	.	.	.	Sunderland,	.	.	.	5,000
W. H. Tobey,	.	.	.	Brockton,	.	.	.	5,000
L. Hardy,	.	.	.	Worcester,	.	.	.	5,000

* This estimate was found to be considerably below the number of eggs received.

A. E. Alden,	Stoneham,	2,000
B. C. Cahoon,	East Falmouth,	5,000
Allen Webster,	Springfield,	5,000
A. P. Tobey,	Waquoit,	5,000
A. O. Thrasher,	Hampden,	5,000
Geo. Huey,	Springfield,	5,000
C. A. Howland,	Adams,	5,000
Wm. Houston,	Wakefield,	1,000
G. C. Bridges,	Warren,	5,000
Richard Pinksohn,	Boston,	5,000
J. S. Overhiser,	Foxborough,	5,000
Appleton & Litchfield,	Boston,	5,000
C. C. Merritt,	Springfield,	5,000
A. E. Scott,	Lexington,	5,000
C. S. Wheeler,	Williamsburg,	5,000
Frank Brooks,	Medford,	1,000
O. Hanscom,	Stoneham,	1,000
John Cummings,	Woburn,	5,000
Wm. H. Mears,	Tewksbury,	5,000

Trout require some one to take charge of them in transportation; and applicants in distant parts of the State would save expense if they could unite and engage one person to look after several lots of fish, meeting him at the different stations on the route. One competent man can take charge of thirty or forty thousand.

Blanks will be forwarded next year to parties who have received trout fry, and a full report of results required. This would have been done before, but the number of young fry at our disposal was so small that it was thought best to wait until a larger and wider distribution over different parts of the State could be secured.

The supply of 350,000 for next April, and the probability of nearly double that amount for the year after, will furnish sufficient data for intelligent reports. The breeding trout now on hand should, when mature, give a million eggs, and that amount is required to supply the demand. The limited number given two and three years ago have been in most cases remarkably successful.

The Commissioners should have authority to close, at their discretion, streams which are stocked by the co-operation of the State, for a period of two or three years, and there should be a general law prohibiting the taking of trout below a certain size.

LANDLOCKED SALMON. (*Salmo salar*, var.)

The distribution of these fish for 1886 was as follows:—

G. W. Morse,	for ponds in Newtonville,	. . . . .	3,000
A. E. Hemphill Chase,	“ Holyoke,	. . . . .	14,500
B. C. Cahoon,	“ East Falmouth,	. . . . .	20,000
T. H. Lawrence,	“ Falmouth,	. . . . .	12,000
I. W. Adams,	“ Ashburnham,	. . . . .	10,000
E. J. Kenneyson,	“ Haverhill,	. . . . .	6,000
E. E. Dewy,	“ Western part of State,	. . . . .	4,000
John E. Sawyer,	for pond in Methuen,	. . . . .	5,000
N. S. True,	“ Lancaster,	. . . . .	3,500
H. H. Dame,	“ North Reading,	. . . . .	5,000
J. F. Wright,	“ Newton,	. . . . .	5,000
C. H. Cary,	“ Pembroke,	. . . . .	3,500
M. V. A. Evans,	“ Graniteville,	. . . . .	3,000
Wm. Houston,	“ Wakefield,	. . . . .	2,000
E. G. Loomis,	“ Bedford,	. . . . .	4,000

As we have stated in previous years, all applications for these fish should be sent before April 1.

SALMON IN THE MERRIMAC. (*Salmo salar*.)

The run of salmon in the spring was smaller than usual, and led to the conclusion that this was an off year for these fish. The fall run, however, was the largest that has occurred at that season.

Late in the summer a communication was received stating that in the spring large numbers of smolts (young salmon), on their way to the sea, entered the canal at Lawrence, and were destroyed passing through the wheels at Russell's paper mills. A reply was sent at once, asking the writer if he would appear at a meeting of the Commissioners at Lawrence, and give them what information he possessed. To this no reply was made. The complaint was the basis of an application for salmon fry to be placed below the dam. A partial investigation was made without eliciting any reliable facts sustaining the charge. As the young salmon run down mostly in the spring, at high water; further effort to ascertain the truth of this statement was postponed until that time, when the Commissioners of New Hampshire and Massachusetts will give it their attention.

We append the Annual Report of E. B. Hodge, Superintendent of the Hatching Works at Plymouth, N. H.

To the Commissioners on Inland Fisheries for the Commonwealth of Massachusetts.

GENTLEMEN:—In January, 1886, I received from Bucksport, Me., 550,000 Penobscot salmon eggs, which with the eggs taken from the Merrimac River salmon at Plymouth, 60,000 in all, were hatched with but little loss, and in May the young fry were planted in the Pemigewasset River. The plant was made at various points from one to twenty miles above the falls. The young fry were strong and healthy, and no loss was incurred in transferring them from the hatchery to the waters of the river. At the time the plant was made the water in the river was within one or two degrees of the same temperature as that in the troughs from which the fry were removed.

The number of brook-trout eggs taken was 500,000, of which one-half (250,000) were sent to Mr. Brackett at Winchester in February and March. There are now over 700,000 eggs of the brook trout in the hatchery, and the number will reach 750,000, one-half of which will be sent to Winchester as soon as they are sufficiently developed.

The breeding trout in the ponds and tanks have been very healthy, no loss has been incurred, either from disease, mink or other enemies. There are now about 10,000 brook trout from four inches in length to three pounds in weight in the breeding ponds, and as many of them are from six to ten inches in length, a large increase of eggs may be expected in 1887.

A new floor has been laid in the hatchery, with new flooring timbers, the old one having become unsafe. A two-inch pipe has been laid from the new spring to the house; the distance was only fifty feet and the expense small. All necessary repairs have been made, and the station is in good condition. I would recommend that 300 of the large male trout be sold and the proceeds used in the purchase of small brook-trout from one to two years old.

E. B. HODGE, *Superintendent.*

PLYMOUTH, N. H., Nov. 17, 1886.

LOBSTERS.

The rapid decrease in the number and size of the lobsters, notwithstanding that the law has been fairly and in some cases vigorously enforced, has created a strong feeling in favor of a closed season.

Lobsters ten and one-half inches long, if they breed at all, are not sufficiently mature to cast any considerable amount of spawn. The ten and a half inch law, while it regulates the lobster to a marketable size, does not provide for any increase in number.

A good many arrests have been made, developing the fact that there is sufficient interest in the unlawful traffic to raise funds to carry one case to the Supreme Court on points of law, where it is now pending.

Whatever may be the decision of the court, some change in the law, increasing the size, and making a closed season for one or two months, is absolutely necessary, if we are to protect this valuable crustacean.

It is a simple common-sense matter in which the Legislature should not allow any prejudice or local interest to interfere to prevent the passage of a law which will be for the public good.

Mr. F. R. Shattuck of Boston has given much attention to the enforcement of the law, and his report is herewith submitted in full. If all the deputies had been as active as he has been, the traffic in short lobsters would have been speedily ended.

For the information of those who are heartily interested in the preservation of fish, game, and insectivorous birds, we would state that chap. 91, sect. 3, Public Statutes, gives the right to the Commissioners to appoint deputies to enforce all laws protecting them.

It is desirable to have such deputies in different parts of the State; but as there is, at present, only a small appropriation that can be used to pay such deputies, the work necessarily must be, to a considerable extent, a labor of love.

It was under this authority that Mr. Shattuck's vigorous work was accomplished.

BOSTON, Nov. 29, 1886.

E. A. BRACKETT, ESQ., *Chairman of the Board of Inland Fisheries, State of Massachusetts.*

DEAR SIR:— Since my appointment as deputy on lobsters, June 19, 1885, I have sought in a measure to fulfil the duties pertaining to the office, with what result I herewith submit.

To my surprise, I found the lobster had no friends; on the con-

trary, many enemies. The supply was handled as though inexhaustible, although the decreasing size, weight and numbers plainly told the tale of a rapid extinction. A lobster weighing four pounds was the exception, and several barrels would be ransacked before one could be found. To be sure, now and then a very large one could be found, but they were of rare occurrence.

The lobster is of slow growth and has many natural enemies besides man, and, as stated by our best naturalists, is five years in arriving at the procreative age, and is then barely $10\frac{1}{2}$ inches in length,—the minimum of size. If this $10\frac{1}{2}$ -inch law could be rigidly enforced, together with a close season of six weeks (the same as Maine has on its statutes), say, from August 15 until October 1, we might again find the lobster comparatively plentiful along our coast. During the time mentioned for a close season the lobster is shedding his shell and recovering from the consequent exhaustion; is very much like a moulting fowl, unfit for food, sick and of little commercial value. I think a majority of the dealers are in favor of a close season, but *what time* of the year that season should be is a mooted question with them.

The value of the lobster commercially considered is about \$300,000 in Boston alone annually, and about \$75,000 in the State outside of Boston,—say, \$375,000 in the Commonwealth. This suggests that the crustacean is of consequence enough for some special protection. Furthermore, should the wanton destruction of the past few years continue, there will be but few remaining to protect, and within ten years this once cheap, ready-to-hand cooked dish for the poor man can only be had at a high price and brought from a distance beyond this Commonwealth, obtainable only as a luxury. I would suggest the legal length of the lobster be made 11 inches, for the lobster of $10\frac{1}{2}$ inches, weighing, say, three-quarters of a pound, will upon shedding its shell that season increase in most instances to the length of $11\frac{1}{2}$ to 12 inches—sometimes more—and almost double its weight. Most of the spawning lobsters are 11 inches and over in length, very few as short as $10\frac{1}{2}$ inches; one more season would almost double the value of the lobster individually and give a larger number for spawning purposes.

I think the inclination of the fishermen is for observance of the laws, but so long as they are enforced by no one it is perfectly natural they should become careless, bold and finally defiant. The past year, through my instrumentality there have been 12 arrests for non-observance of the laws and all brought to trial. Two pled guilty (one to two offences), and paid their fines; nine were found guilty after trials in the lower court, and appealing to the upper

court, one then paid fine rather than stand trial. Another case was won and has gone to the Supreme Court on questions of law; the other cases being continued, awaiting final decision in this case. I append printed report.

[From the Boston Evening Transcript.]

DEFENDANT'S COUNSEL INTERPOSES A NOVEL MOTION.

Complaints made by Capt. F. R. Shattuck, deputy fish commissioner, against numerous parties having in their possession lobsters less than the length prescribed by chapter 212 of the Acts of 1884, have been reached in the Superior Criminal Court. The statute reads as follows:

Section eighty-four of chapter ninety-one of the Public Statutes is amended so as to read as follows: "Whoever sells or offers for sale, or has in his possession, a lobster less than ten and one-half inches in length, measuring from one extreme of the body extended to the other, exclusive of claws or feelers, shall forfeit five dollars for every such lobster; and in all prosecutions under this section the possession of any lobster not of the required length shall be *prima-facie* evidence to convict."

One of the cases coming up on Tuesday, Mr. Augustus Russ moved to quash the complaint, on the ground that the statute was absurd and nonsensical, and that it was evidently one of those pieces of legislation enacted without scrutiny of the language necessary to carry out the intent. Mr. Russ further argued that the provision that possession shall be *prima-facie* evidence for conviction could not be maintained, and cited the decision of the Supreme Court, where that court held that Hall & Whipple could not be convicted of having in their possession woodcock killed in Pennsylvania, although the statute under which that complaint was made set out that possession was *prima-facie* evidence for conviction.

Judge Hammond said that he was of the opinion that the act was nonsensical, and if the government had the right of appeal he would sustain the motion to quash; but as the government had not that right he would overrule the motion and let the case go to the Supreme Court, which alone could settle the matter.

[From the Boston Herald.]

THE SHORT LOBSTER CASES GOING TO THE SUPREME COURT ON LAW QUESTIONS.

The cases of William A. Barber, Andrew Ferry, *alias* Ferra, William James, James Mariano, Daniel MacDonald and Andrew F. Pope, for a violation of the statute in taking short lobsters, less than $10\frac{1}{2}$ inches in length, came up before Judge Hammond in the Superior Criminal Court yesterday afternoon, Augustus Russ appearing for the defendants and T. J. Dacey for the prosecution. Barber pleaded *nolo contendere*, and Mr. Russ filed a motion to quash the complaints for the reason that they did not set out any offence with reasonable or substantial certainty, and for the further reasons that the provisions of the

statute on which the complaints are founded are repugnant to each other and void. The court overruled the motion to quash, and the case will go to the Supreme Court on questions of law, the other cases being continued to await a final decision in Barber's case.

I would suggest the convening of Commissioners from all the New England States to formulate uniform laws for the protection of the lobster along our entire coasts and a concerted action for the enforcement of laws so enacted. Until this is done we shall see this valuable crustacean, gradually in some places, rapidly in others, pass from our tables and sight, but never from the memory of those who appreciate them as they should be appreciated.

Yours very truly, F. R. SHATTUCK.

Deputy Fish Commissioner, State of Massachusetts.

BOSTON, Nov. 4, 1886.

MR. E. A. BRACKETT, *Chairman of Commissioners on Inland Fisheries.*

DEAR SIR:—The limited time (since my appointment as "deputy" by you, June 1, 1886) I have had to attend to the observance of the laws in my district, covering Dartmouth and towns adjoining, satisfied me that there is a general disposition to accept the situation without any unusual pressure on the part of the deputy.

The liberal distribution of printed matter by the Massachusetts Fish and Game Commission has instructed the country people in a way they have not been before on these points; and where before they ignorantly evaded the laws relative to taking of fish, etc., they now are well-informed, and seem desirous to conform to same. I have had frequent applications for interpretations of the law, so that the applicant would not infringe same.

The selectmen of the adjoining town of Westport have appointed Mr. Wm. Valentine as town deputy, and he has been interested and zealous in bringing any trespassers against the laws to my attention. I am convinced the work being done at this time by the Massachusetts Fish and Game Association, and in the way it is done, reaching those who would not in any ordinary way be informed as to the laws, and would not interest themselves particularly to know. This kind of work requires more of a personal attention than the usual course of distribution, which seldom reaches those whom it is most desirable to furnish with information bearing on this subject.

Yours respectfully,

W. F. ALMY,

Deputy for Dartmouth and adjoining Towns.

UNITED STATES COMMISSION, FISH AND FISHERIES,
WASHINGTON, Dec. 4, 1873.

MESSTRS. STILWELL and STANLEY, *Fish Commissioners of Maine.*

GENTLEMEN :—My attention has been especially directed the past season to the subject of the lobsters on the New England coast, and I have received from numerous parties the assurance that unless something be done to regulate this branch of industry, it will before long become practically worthless. I have been told by many reliable persons that, not only has the size greatly diminished, but that the numbers taken are much fewer than formerly. In view of the extension of the lobster fisheries within a few years past, principally for the purpose of canning, this result was not unexpected, although it seems to have come at an earlier period than was anticipated.

With a view of securing for you the most reliable information in regard to this species, I beg to append herewith a paper written at my request by Mr. Sidney I. Smith of Yale College, New Haven, who is our best specialist in reference to the American crustaceans, and who speaks quite by authority in all that he states.

It is for yourself to judge how far the reasoning therein presented will render special legislation expedient for the State of Maine.

At present there appears to be no possible remedy beyond that of restricting the catch for a greater or less period of time; and unless this be done, it is most probable that the diminution will continue at an alarming rate.

The most simple law would be one absolutely prohibiting for a certain time the capture of lobsters, whether for immediate sale or for canning, making the penalty sufficiently severe to deter those who may be so inclined from violating it. If the months of July and August were named as this period of prohibition, it would go far to secure the needed protection, and perhaps cover the most critical portion of the spawning season.

It is not sufficient simply to protect the female, or those that have eggs, but the prohibition of capture should extend to both sexes. For the better understanding of the differences between the male and female lobster, referred to by Mr. Smith, I have caused some figures to be engraved, of which I beg your acceptance.

Very respectfully,

(Signed) SPENCER F. BAIRD, *Fish Commissioner.*

NOTE ON THE NATURAL HISTORY OF THE LOBSTER.

BY PROF. SIDNEY I. SMITH.

The American lobster is found upon the Atlantic coast, from New Jersey to Labrador, and yet almost nothing has been published in regard to its traits and local distribution. It lives upon rocky, gravelly and sandy bottom, from low water down to twenty or thirty fathoms and perhaps deeper, but not probably at great depths. It feeds upon any kind of animal matter, either fresh or decaying, which it can discover.

In Long Island Sound the lobster fishing begins late in March or early in April, and continues till late in the fall, although the greater part are taken in May and June. On the coast of northern Massachusetts and Maine, whence the winter supply comes, they may be taken nearly all the year round. Captain N. E. Atwood, writing in 1866, says they do not come into shallow water about Provincetown, Mass., till June, and remain till October, when they disappear from near the shore. He also says that north of Cape Cod the male lobsters are more abundant than the female, while south of the Cape the reverse is true. As far, however, as I have myself observed along Long Island Sound and Vineyard Sound, at Portland and Eastport, Me., the sexes are taken in about equal numbers. As this is a question of considerable interest, it may be remarked that the sexes can be readily distinguished by the little appendages upon the under side of first ring of the tail. These are stout, stiff, horny and grooved on the inside towards the tips in the male, while in the female they are smaller, slender, soft and flexible; moreover, the genital orifices in the male are on the inside of the basal joint of each of the hind pair of body legs, while in the females they are situated in similar places upon the third pair, or hinder of the pincher-like legs.

In attempting to suggest means for preventing the exhaustion of the lobster fisheries, the time of spawning and the development of the young become matters of great importance. The time at which the females carry eggs varies very much on different parts of the coast, being later and later as we go further north. South of Cape Cod, in Long Island and Vineyard Sounds, they are found carrying eggs from the first of April till late in June. At Portland, Me., they were carrying eggs till the middle of August, while in the Bay of Fundy they are found with eggs from midsummer till September. More exact information on this point is very desirable, although this is enough to show that the period of carrying eggs covers the time during which a great part of the lobsters are taken for the market.

Soon after the hatching, the young leave their parent and live for a considerable period a very different life from the adult. At first they are not more than a third of an inch long, and have scarcely any resemblance to a lobster. They are furnished with long swimming branches to the legs and swim about freely in the water, living most of the time near the surface of the water, like many kinds of free-swimming shrimps. With each change of the skin they become more and more lobster like, until when a little more than half an inch long they appear like veritable little lobsters, but still have the free-swimming habits of the earlier stages. During this period, which must be several weeks, they are constantly exposed to the attacks of fishes and all sorts of marine animals, while they themselves pursue and feed upon still smaller fry. Any attempt to rear great numbers through these stages in confined areas would probably prove unsuccessful, as the young at this time require a great amount of pure sea-water and peculiar food, found only where minute, free-swimming animals congregate.

After they become a few inches long, the growth of lobsters is very slow. They increase in size only at the times of shedding the shell, which probably takes place only once a year for those of ordinary size, and the increase at each of these changes is very small, as may be seen by comparing the size of the cast shell with the lobster a few days after leaving it. In lobsters of very large size the shell is not always changed even as often as once a year.

How early they begin to breed is somewhat uncertain. Females not more than half a pound in weight are, however, found carrying eggs, but in these small females the eggs are comparatively few in number. The average weight of lobsters sold in New Haven market is about two pounds.

It will readily be seen that any close time which should cover the entire period of spawning would stop the lobster fishing during the height of the season, when nearly all the profit is derived from the business. During the hottest weather of midsummer, vast numbers die while being marketed. Preventing their capture at this time would undoubtedly, after a few years, have a marked effect upon the supply during other parts of the season.

CARP.

In the fall of 1880 we received from Professor Baird, U. S. Commissioner, about two thousand young carp.

After supplying all applicants, there were about four hundred left, which we placed in the reservoir at the Tewksbury

Almshouse, with the understanding that if wanted for breeding purposes they could be taken out.

As the reservoir furnished little or no natural food for them, they had to be fed. This was done by using the refuse and stale bread from the Almshouse. The water was too deep and cold for successful culture, and the spawn and young fry were evidently eaten up by their enemies, which were found to be numerous in the reservoir.

Finding that the carp did not increase in numbers we made strenuous efforts to find a suitable breeding pond. Many places were found, but when it was known that the *State* wanted them, the demand for rent was so exorbitant that we refused to have anything to do with them.

One man, for a worthless piece of pasture land, wanted *one hundred dollars annually* for the flowage of about *one acre*.

On the 10th of last May, a small pond on the farm of Wm. H. Mears, in Tewksbury, two miles below the Almshouse, was secured and steps taken to enlarge it by the construction of a new dam, and so far completed that on the 11th of June fourteen large carp were placed in it. These were removed from the reservoir by means of a sweep seine; but the reservoir was so constructed, being partially walled up with stone, that all further efforts to obtain carp from it with the seine were useless.

As the reservoir had not been cleaned for some years, Dr. Fisher decided that it might as well be done then as later in the season, and on the 20th of June the water was sufficiently low to enable us to remove to the new pond sixty more large fish, weighing from two and a half to six pounds. They were taken from the reservoir and put into the cans by hand, and in the excitement, the men, often catching them by the gills, injured a number. Twelve died the day after they were placed in the new pond, leaving sixty-two large carp there at the present time.

We are under obligations to Dr. Fisher, the able Superintendent of the Almshouse, who rendered us all the assistance in his power in taking and removing the fish to their new quarters.

As soon as the new pond was flowed, it was taken posses-

sion of by a great number of frogs and turtles; the former were caught with hook and line, the hook being baited with red flannel, and the latter were shot with a Flobert rifle. These reptiles would not have injured the old fish, but to the spawn and young fry they would have proved fatal.

An examination of the carp showed that many of them had deposited their eggs before being removed to their new quarters; the remainder commenced spawning a few hours after they were put into the pond.

The spawn hatched well and the young fish were of good size for distribution in the fall, enabling us to liberally fill all orders, except two or three which were mislaid; these will be attended to in the spring.

There are several thousand young fish left in the pond, and the applicants for next year will doubtless receive all that are necessary for stocking their waters.

We have been obliged to refuse parties who have asked for carp to put into streams and ponds full of carnivorous fish, for they do not thrive well among their enemies; at any rate, it would be useless to put them in such places in small numbers. We expect in the future to have sufficient stock to allow parties to try the experiment, if they choose to do so.

Carp can be sent by express to any part of the State. Applicants for these fish, as well as for all others distributed by the State, must, when not known to the Commissioners, obtain the endorsement of either the senator or representative of their district.

Carp distributed October, 1886.

J. C. Delney, Gill.	M. V. A. Evans, Graniteville.
Wm. N. Stone, Wellfleet.	C. F. Avery, Newtonville.
Calvin Stone, So. Lancaster.	H. H. Patten, Springfield.
H. E. Snow, Hopkinton.	J. B. Peck, North Attleborough.
Wm. J. Wright, Duxbury	F. Cass, Holliston.
H. Loomis, West Springfield.	C. C. Hitchcock, Ware.
D. L. Shaw, Chicopee.	D. B. Holcomb, Chester.
C. H. Bemus, Granby.	Oscar Pippig, Lawrence.
J. C. Young, Wellfleet.	G. C. Cannon, Lawrence.

Most of the applicants received sixty fish each.

Mr. Mears, who constructed the pond and has had charge of the fish, has done his work faithfully and liberally.

The cultivation of carp is rapidly increasing. There are at the present time nearly thirty thousand persons in the United States engaged in this work.

CONNECTICUT RIVER.

The last Legislature passed resolutions in regard to the fisheries of the Connecticut River, which were forwarded by the Governor of this State to the Governor of Connecticut.

It appears that these resolutions were referred to their Fish Commissioners to investigate and report to the next General Assembly.

Their report, which at first glance seems to be a fair answer to a part of the resolutions, is nevertheless so at variance with the real cause of complaint, that we have thought best to give it in full.

A COMMUNICATION FROM THE STATE OF MASSACHUSETTS RELATING TO THE ENFIELD DAM.

In the month of April your Commissioners received from the Secretary of State a letter enclosing a resolution of the Legislature of Massachusetts. The preamble complains that the Enfield dam is an obstruction to the passage of shad, and the resolution suggests that mutual measures be taken by the two States for the restoration of shad to the river.

The letter of the Secretary of State is to the effect that the resolution was, by the General Assembly of Connecticut, referred to the Fish Commissioners to investigate and report to the next General Assembly.

The letter and resolutions are given in full :

STATE OF CONNECTICUT,

OFFICE OF SECRETARY OF STATE,

HARTFORD, April, 1886.

DEAR SIR : — The accompanying is a copy of a preamble and resolution of the General Assembly of the State of Massachusetts referred by the General Assembly of this State to the Fish Commissioners, to investigate and report to the next General Assembly. Truly yours,

CHARLES A. RUSSELL, *Secretary.*

COMMONWEALTH OF MASSACHUSETTS.

In the year One Thousand Eight Hundred and Eighty-six.

Resolution concerning the obstruction to the passage of Shad in the Connecticut River.

Whereas, it appears that by the maintaining a dam across the Connecticut River at Enfield, in the State of Connecticut, by parties in the jurisdiction of the State of Connecticut, the shad fisheries of the citizens of Massachusetts are practically destroyed, because of the obstruction of said dam to the run of the shad up the river.

And whereas, the dam is almost an impassable barrier to the passage of the fish, and Massachusetts citizens being thus deprived of the shad, there is little inducement for Massachusetts to continue the artificial propagation and cultivation of the shad in that river.

And whereas, if the obstruction of the dam was modified, as it might be, to allow the passage of the fish, Massachusetts would gladly, in connection with Connecticut, re-establish the hatchery at South Hadley; as the artificial cultivation and propagation of shad is now so well understood and is so successful that the Connecticut River can be stocked with shad plentifully and cheaply to the great benefit of the people of both States, therefore,

Resolved, That the Commonwealth of Massachusetts respectfully suggests to the State of Connecticut that mutual measures be taken by the said States for the restoration of the shad to the river.

That a copy hereof be transmitted by His Excellency the Governor to His Excellency the Governor of Connecticut.

HOUSE OF REPRESENTATIVES, April 7, 1886.

Adopted. Sent up for concurrence.

EDWARD A. McLAUGHLIN, *Clerk*.

Concurred.

SENATE, April 9, 1886.

S. N. GIFFORD, *Clerk*.

SECRETARY'S DEPARTMENT, April 10, 1886.

A true copy, witness the seal of the Commonwealth.

HENRY B. PEIRCE, *Secretary of the Commonwealth*.

STATE OF CONNECTICUT, ss.

OFFICE OF SECRETARY OF STATE.

I hereby certify that the foregoing is a true copy of record in this office.

In testimony whereof, I have hereunto set my hand, and affixed the seal of said State, at Hartford, this 15th day of April, A. D. 1886.

CHARLES A. RUSSELL, *Secretary of State*.

That the matter in question may be thoroughly understood, and the actual facts be stated at the outset, your Commissioners have prepared a table, made up from the reports of the Massachusetts

Fish Commissioners, showing the number of shad caught each year from 1869 to 1885 inclusive. The first column gives the number of shad caught at the South Hadley Falls fishing place, and the second column gives the number of shad taken at all the fishing places between Holyoke Dam and the Connecticut boundary line.

YEARS.	Shad caught at South Hadley Falls.	Shad caught at all places in Massachusetts be- tween Holyoke Dam and State boundary line.
1869,	8,807	
1870,	779	
1871,	None reported.	
1872,	4,822	
1873,	3,598	
1874,	3,016	
1875,	None reported.	
1876,	10,741	12,792
1877,	3,412	6,503
1878,	8,169	17,790
1879,	6,296	13,409
1880,	4,698	7,727
1881,	18,196	38,382
1882,	None reported.	2,770
1883,	3,099	3,591
1884,	1,539	1,593
1885,	1,718	1,718

It will be noticed that 1,718 shad were taken at South Hadley Falls in 1885, the last season before the passage of the resolution. It does not seem possible that so many shad could pass over an impassable dam. If nearly two thousand shad could pass over the dam, five thousand or ten thousand could do the same, and doubtless would do so if they should succeed in ascending the river to that point. This fact alone demonstrates that the Enfield dam is not an obstruction to the passage of shad. The cause of the diminution in the number of shad at South Hadley Falls must be sought for elsewhere. A few facts may furnish a clue to the real cause. From 1869 to 1881, the laws of the two States in reference to fishing in the Connecticut River were similar. In the later years of the period, the season for taking shad expired on the 20th of June, and the fishermen of both States were required to use a mesh of five inches for their nets, thus allowing the small shad to escape. The Massachusetts fishermen, however, frequently made complaint that their brothers of Connecticut were catching more than their share of the fish, and insisting that the pounds near the mouth of the River should be abolished, and three days of the

week observed as close time, during which no shad should be taken in Connecticut. Finally, in 1880, threats were made that if Connecticut would not do what was fair, some radical step would be taken by Massachusetts to force the desired result. Accordingly, early in 1881, before the opening of the fishing season, the Legislature of Massachusetts passed an act, to take effect from its passage, allowing the fishermen to take shad until the first day of July, and permitting the use of a two-inch mesh, thus insuring the capture of the baby shad with the larger ones. A copy of the act mentioned is here given.

An Act to amend the law regulating fishing in Connecticut River and its Tributaries.

SECTION 1. Any person who shall take or aid or assist in taking from the Connecticut River or any of its tributaries, within the limits of this Commonwealth, any shad or alewives at any other time than between the fifteenth day of March and the first day of July in each year, shall forfeit and pay for each offence the sum of one hundred dollars.

SECT. 2. Section three of chapter seventy-six of the Acts of eighteen hundred and sixty-nine is hereby amended by striking out the words "fifteenth day of June in each year, the meshes whereof are less than five" in the eighteenth and nineteenth lines, and inserting the words, "first day of July in each year, the meshes whereof are less than two" in place thereof.

SECT. 3. Chapter three hundred and sixty-nine of the acts of the year eighteen hundred and seventy, and all acts and parts of acts inconsistent with this act, are hereby repealed.

SECT. 4. This act shall take effect upon its passage. [Approved March 2, 1881.]

By referring to the above-mentioned table, it will be seen what the practical effect of this measure was. It must be recollected that the act took effect previous to the fishing season of 1881.

In the year 1880, 4,698 shad were taken at South Hadley Falls, and 7,727 in the waters of the Connecticut River within the State of Massachusetts.

In 1881, 18,196 shad were taken at South Hadley Falls, and 38,832 in the Connecticut River in the State of Massachusetts, nearly five times as many as the previous year. The fine mesh of the nets enabled the fishermen to capture shad of all sizes, and it was pitiful to see the number of young shad no larger than alewives. Is it any wonder that they killed the goose that laid the golden eggs? The effect of the proceeding, as might have been expected, was to ruin their own fisheries by nearly exterminating the breeding fish. As the fishery at South Hadley Falls is the last fishery before reaching the Holyoke dam, the destruction of the

mature shad would be much more serious at that point than any other, for the reason that the ova are more advanced and nearer the time of deposit than in any other part of the river. Then the eleven days from the 20th of June to July 1, after the open season has closed in Connecticut, are much more destructive to the shad than any previous time, from the fact that the water has become so warm that the shad ova mature more rapidly than when the water is colder. There is no doubt that the amount of fishing in the Connecticut River, and the waters adjacent to its mouth, is too great for the shad to withstand without artificial aid, and this suggests the words of the resolution relating to mutual measures of the two States for the restoration of shad to the river.

It may be stated that from 1869 to the present time the Commissioners of Connecticut have annually (with one or two exceptions, when short of funds) hatched and placed in the Connecticut River as many young shad as could be obtained for the money at their disposal, and have never received any financial assistance from Massachusetts. All the expenses of the shad-hatching operations on the Connecticut River from 1869 to date have been defrayed by the State of Connecticut, with the exception of one or two years, when a portion of them was paid by the U. S. Fish Commissioner, Prof. S. F. Baird.

In the year 1883, one of your Commissioners called upon one of the Massachusetts Commissioners and proposed that each contribute a given sum towards propagating shad at South Hadley Falls. The offer was declined with an allusion to the unfair laws of Connecticut, and the subject was dropped. Since that time, shad-hatching operations have been successfully carried on below the Birmingham dam on the Housatonic River, and millions of young shad hatched there have been placed in the Connecticut River, within the boundaries of Connecticut. Up to the present time, the location at Birmingham has seemed so well adapted to the work that the Commissioners would hesitate before deciding upon a change, especially as there are hardly shad enough in the upper waters of the Connecticut River to warrant operations upon a large scale. Any propositions, however, from the Massachusetts Commissioners upon this subject or any other would meet with respectful attention and careful consideration.

Your Commissioners did not counsel the adoption or sending of resolutions. On the contrary, the Chairman distinctly stated to the Committee on Fish and Game, that, in his judgment, any action of this kind was a waste of

time; that the experience of the Commissioners with the State of Connecticut had been of such a nature as to forbid any further overtures on our part; * that the resolutions were misleading, and did not touch the real cause of the decline of the fisheries; and that the only way that this question could be fairly settled would be by an act of Congress regulating the fisheries of rivers running through more than one State.

The Committee and Legislature thought differently.

Considering this movement, therefore, in the light of a separate action for which we were not responsible, we might with propriety rest the matter here, were it not that the interest of fish culture and fair play between two States demand that some of the statements in the Connecticut report be set right.

It is certain that the dam at Enfield is an obstruction to the passage of shad, and consequently injurious to the fisheries of the river.

The evidence before the Legislative Committee showed that the fish could not make their way over the dam at low water, but congregated in the pools below and were caught out. Could all fishing be prohibited for a reasonable distance below, better results would follow. With these exceptions, we agree with their report so far as it relates to the dam; and had the Connecticut Commissioners confined themselves to the resolutions, and not gone outside of them, dragging in issues which were entirely uncalled-for by the action of this State, there could have been no serious objection to their report by any one understanding the facts; but when they state that the *real cause* of the diminution in the number of shad is due to the act passed by this State in 1881, we beg leave to differ, and to express our surprise that any one at all conversant with the history of the fisheries of this river could have seriously made such a statement. While said act may have been unwise, and perhaps prompted by a feeling of retaliation on the part of the fishermen for the injuries done them, and for which they saw no hope of redress, we see no reason why it should be used to divert attention from the well-known cause of the scarcity of shad in the river.

* See Appendix C.

Heretofore there has been no difference of opinion between the Commissioners of the two States upon this point.

In 1879, through the success of artificial hatching, the catch on the lower part of the river reached 436,981 shad. The catch in Massachusetts for the same season was only 13,409.

Against this unequal distribution of the products of the river the fishermen of this State naturally complained, and your Commissioners urged upon the State of Connecticut some regulations by which this State should receive its share of the fish. The Commissioners of Connecticut acknowledged the justice of the claim, but confessed themselves powerless to remedy the evil. In one of their reports they say : —

“As the shad gained in numbers and size, the fishermen multiplied in proportion; and seines, gill-nets, and pounds were constructed with such vigor, that soon it seemed wonderful that any shad succeeded in passing up the river to their spawning grounds. Laws to restrict the fishing on certain days of the week could not be enforced by any power in the hands of the Commission, because the public sentiment of the people of the neighboring towns was in sympathy with the fishermen.”

We might make many quotations from the reports of the Commissioners of both States all to the same point; but no language can add force to this simple statement of facts, rendering it unnecessary to go elsewhere for either the cause of complaint of the fishermen of this State, or the depletion of the shad fisheries of the Connecticut River.

The statement that “from 1869 to the present time the Commissioners of Connecticut have annually (with one or two exceptions, when short of funds) hatched and placed in the Connecticut River as many young shad as could be obtained for the money at their disposal, and have never received any financial assistance from Massachusetts,” is so worded as to convey a wrong impression.

The reader would naturally draw the conclusion from this paragraph that the Commissioners of Connecticut had been active during most of this time in hatching shad for the benefit of *this* State as well as for their own. The record shows that in 1867 and 1868 the two States co-operated at

South Hadley, each bearing its proportion of the expense. From 1870 to 1873, inclusive, the Commissioners of Connecticut continued the work. In 1874 Professor Baird, U. S. Commissioner, joined with them, paying an equal share of the expense, Massachusetts furnishing apparatus, and paying \$29.43. For the years 1875, 1876 and 1877, Professor Baird carried on the hatching, one-half of the product being put into the Connecticut River.

Thus it appears that the Connecticut Commissioners carried on the hatching at South Hadley, — two years in connection with Massachusetts, one year with Professor Baird and five years of the eighteen alone; and this constitutes all the hatching that they have done which could in any way benefit this State. *In all cases* Massachusetts has furnished the hatching apparatus, which cost, with the right to use it, several hundred dollars; and as the catch on the river in this State has been something less than four per cent. of the whole catch on the river, it is a question whether Massachusetts did not pay her full proportion of the expenses. In view of these facts, it is difficult to understand their statement of continuous hatching, and that they “have *never* received any financial assistance from Massachusetts.”

This State has always been ready and willing to enter into any reasonable arrangements for re-stocking and maintaining the fisheries of the river; but with fifty-eight pounds and weirs, four sweep-seines and fifty-five gill-nets, in Connecticut water, and running night and day, with no let-up or regulations to control them, is it any wonder that we declined to contribute to this wholesale destruction, or that we agreed with the Connecticut Commissioners that “it seemed wonderful that any shad succeeded in passing up the river to their spawning grounds.”

The position of Massachusetts is clearly stated in the following extract from our report of 1880: —

CONNECTICUT RIVER.

Beyond placing a superintendent over the fishway at Holyoke, no expense has been incurred and nothing done toward increasing the fish in the river.

The reasons for this have been so fully explained in previous reports, that it seems useless to rehearse them here. Neither the views of the fishermen, nor the opinions of those whose sense of duty should lead them to see that justice was done to a sister State, have changed for the better. On the contrary, counter-charges have been made that the fishway at Holyoke was defective, if not entirely useless, and that the shad were destroyed on their spawning grounds. Even the Commissioners of Connecticut have published in their report statements which, upon more careful investigation, might have been shown to be unreliable.

They seem to be unmindful of the fact that *the fishway at Holyoke was the result of the joint action of the Commissioners of the four States interested*, — viz., Vermont, New Hampshire, Massachusetts and Connecticut, — and that the present able Commissioners of the last-named State were as much responsible for it as were those of Massachusetts. Certainly, no formal demand has been made by them to change it. There can be no question that, had Connecticut shown any disposition to deal fairly in this matter, the Massachusetts Commissioners would have exhausted every means to correct any deficiency in the fishway, and in that effort would have been fully sustained by the State.

As to the sin of “taking shad on their spawning beds,” imputed to the Massachusetts fishermen, it should be observed that, no matter *where or at what time of the year* a fish is killed, its spawn is *equally destroyed*. Thus, a shad’s spawn is lost whether the fish be killed in December, eleven months before it would have spawned, or in June, eleven minutes before it would have spawned. Therefore, the Connecticut fisherman who takes a hundred shad at the river mouth destroys their spawn; and the Massachusetts fisherman who, two days later, takes another hundred at Holyoke from the same school, destroys *their* spawn. The returns presented below show that Connecticut, in 1879, took thirty-two times as many shad as did Massachusetts, and destroyed, therefore, thirty-two times as much spawn, which, otherwise, would have been deposited in the river.

The following statement is taken from the report of Connecticut for 1879 : —

PIERS AND SEINES.

Piers and seines are classed together, because a pier is simply a place made for the purpose of hauling a seine. Of these there are fifteen, and they took fifty thousand shad. The greatest number taken at any one place was eleven thousand at Selden’s fish-place, a short distance below the Deep River station on the Connecticut Valley Railroad. These statistics comprise only that portion of the river from Deep River down, and

the number of shad taken above can only be estimated. Those whose opinions are considered valuable make this estimate fifty thousand, which is accurate enough for practical purposes.

The whole number of shad taken, then, in 1879, in the Connecticut River and sound adjacent, is as follows:—

Pounds	250,026
Gill-nets	86,955
Seines	100,000
	<u>436,918*</u>

Let it be supposed that the fisherman received fourteen dollars per hundred for shad, and the money value of the catch is \$61,177.34; or if it be assumed that each shad weighed three pounds, and the retail price was eight cents per pound, the value would be \$104,875.44, which shows what interest the citizens of Connecticut have in the shad fisheries of this one river.

The report for this State for the same season will show the difference in the catch of the two States.

TABLE NO. IV.—CONNECTICUT RIVER SEINES.

TOWN.	NAME.	Shad.	Pike.
Agawam,	A. Converse,	1,352	—
"	A. J. Hills,	596	—
South Hadley,	C. C. Smith,	6,296	3
Chicopee,	J & H. W. Chapin,	1,224	—
West Springfield,	George A. White,	1,372	—
Springfield,	J. O. Leary,	69	—
"	R. H. Parker,	2,500	—
		<u>13,409</u>	<u>3</u>

The total money value, at fourteen dollars per hundred, would be —

For Massachusetts	\$1,876 00
Connecticut	61,177 34

These figures are mainly correct, and against them no charge or counter-charge can avail.

They show conclusively that, while the breeding grounds are in this State, the catch of fish is almost wholly in Connecticut.†

* It should be understood that these figures relate only to shad of three pounds and over. Small shad are not counted.

† It should be remembered that while there are *sixty* miles of the river in Connecticut, there are only *twelve* miles in Massachusetts from the State line to the Holyoke dam.

Is the killing of a shad, then, a crime at South Hadley and not a crime at Saybrook? If let alone they would all reach their spawning grounds; and when Connecticut allows a reasonable number to ascend the river, there will be no difficulty about appropriations for hatching or stringent laws for protection in this State.

With all the known facts, attested by the reports of the Connecticut Commissioners, there can be no doubt as to "who killed the goose that laid the golden eggs."

Over the imaginary results of the Acts of 1881 their report becomes pathetic, and the mourning of the Commissioners over the supposed death of a few baby shad at South Hadley "pitiful to see," unmindful of the fact that these young fish are slaughtered by the wholesale every year in the pounds and weirs at the mouth of the river, must be amusing to the Connecticut fishermen.

For reasons which are not very apparent, the catch of shad on the river in this State, from 1869 to 1885, is given in their report.

As figures derive their value from association, we have set beside the figures in this table, so far as we have been able to obtain the record, the catch on the lower part of the river, including the pounds and weirs at the mouth, from 1879 to the present time.

	Catch In Connecticut.	South Hadley.	All places from State line to Holyoke Dam.
1879,	436,981	6,296	13,409
1880,	269,918	4,698	7,727
1881,	351,678	18,196	38,382
1882,	272,903	4,229	6,990
1883,	177,308	3,099	3,591
1884,	150,045	1,539	1,593
1885,	190,300	1,718	1,718
1886,	117,950	577	577
Total,	1,967,083	41,352	73,987

It will be seen that since 1879 there has been a decrease of nearly seventy-five per cent. in Connecticut, and about ninety-five per cent. in this State. Let any one glance down

these columns and see where they must end. They point unerringly to the destruction of the shad fisheries of the Connecticut at no distant day. Not all the young shad hatched on the Farmington River, or on the Housatonic at Birmingham, and put into the lower part of the river, will save them. Nothing but stringent regulations honestly enforced, with hearty co-operation with this State, can avert the catastrophe. Of this we are sorry to say there seems to be little hope.

The figures we have given are from the Connecticut reports. The Commissioners of that State are familiar with all the facts; but instead of presenting to their Legislature a broad, statesmanlike view of the whole case, they have chosen to divert attention from the main question by a side issue, the objectionable features of which, they had reason to know, would be removed the moment that Connecticut showed a disposition to deal fairly with this State.

By their unfortunate report they lost a golden opportunity; and it may be said with considerable certainty that the fisheries of a river which, in 1879, yielded, through the aid of artificial hatching, nearly *seventy-five thousand* dollars worth of shad, might, with the exercise of a little common sense, be made to produce many times that amount.

There are indications that the shad of the Connecticut will soon become a thing of the past, for there is no reason to suppose that the fishermen on the lower part of the river will become less rapacious, or abandon their supposed right to run down the last shad, as they did the salmon* with which the Commissioners of the four States once stocked the river.

The case may be summed up in a few words:—

First. The Enfield dam is not a serious obstruction to the passage of shad at high water, *provided* that all fishing is prohibited for a reasonable distance below it.

Second. Massachusetts has always been ready to heartily co-operate with the State of Connecticut whenever any reasonable arrangements could be made to insure benefits to both States.

* In Appendix, see extract from Report of 1878.

Third. It is no more a crime to kill a shad at South Hadley than at Saybrook.

Fourth. If it is true that a few immature shad have been destroyed by the use of small-mesh seines in the river in this State, it is but as a drop to the ocean compared to the wholesale destruction of these fish in the weirs and pounds at the mouth of the river, where miles upon miles of small mesh nets are used, and it is absurd to charge the destruction of the shad fisheries upon the fishermen of this State.*

Fifth. It would seem to be useless for Massachusetts to spend a single dollar hatching shad at South Hadley, so long as the present system of fishing is allowed on the lower part of the river. This must be apparent to any one who will take the trouble to compare the figures which have been presented of the catch of fish in the two States.

Since writing the above, the following statements have been received from C. C. Smith, who is an owner in the fishing grounds at South Hadley, and has for many years managed the fishing at that place. He has been several times elected a member of the Massachusetts Legislature.

It should be remembered that this is the only place on the Connecticut River where ripe shad for spawning purposes have been successfully taken.

SPRINGFIELD, Mass., Dec. 3, 1886.

To the Commissioners on Fish and Game.

The following is a statement of the number of years and dates of hatching shad by Commissioners at South Hadley :—

- In 1867. Seth Greene began experiments, without much success.
- 1868. Seth Greene carried on hatching, with good success.
- 1869. No hatching.
- 1870. Connecticut Commissioners had charge of hatching, which was carried on by Messrs. Rankin and Tolby of Connecticut.
- 1871. Connecticut Commissioners had charge; work carried on by C. C. Smith.
- 1872. Ditto.
- 1873. Ditto.
- 1874. Ditto.

I hold receipts from Dr. Hudson for payments in 1871, 1872 and 1873.

* In Appendix, see extract from report for 1878.

1874. Dr. Hudson paid me \$470; Professor Baird, \$470; Mr. Brackett, \$29.43. I hold receipts from each one for 1874.
1875. I take it for granted that Professor Baird, U. S. A., paid for the years 1875, 1876 and 1877, as he paid me for the hatching and all expenses for the same.

In 1881, 1882 and 1883 I hatched, at my own expense, many millions of young shad and turned them into the river. As to the statement made by the Connecticut Commissioners, of the use of small-mesh seines, I desire to say that to my knowledge there has not been a two-inch mesh net used in this river for shad fishing from the State line to Holyoke dam since I was a boy. In 1881 there were some small shad taken in the seine in consequence of the great number of large ones, that packed the net so that the small ones could not get out. I made it a business to follow down the net, and with the help of the fishermen put them all back into the river alive. In 1881 *three and one-quarter* mesh was used for that year. In 1882, 1883, 1884, 1885 and 1886 a *five-inch* mesh was used.

If the Connecticut Commissioners will come to Springfield any time during the shad season and see the large number of small shad which are shipped here from their State, they may learn something about their own fishermen. It is not true that "baby shad" have been killed at South Hadley. Yours truly,

C. C. SMITH.

RETURNS OF WEIRS, SEINES AND GILL-NETS.

Returns have been received from 124 fisheries of the following kinds: 59 pounds or weirs, 16 sea seines, 31 gill-nets, 1 Connecticut River seine, 1 Merrimac River seine, 8 Taunton River seines, and 8 other fresh-water seines. On comparison with the season of 1885, it appears that 60 less returns were received this year. Ten men who returned last year have sent word that they are no longer fishing, and two have died; but these are more than offset by sixteen from whom returns were not received last year.

Compared with the returns for 1885 there is a decided falling off in the total numbers of fish reported.

In 1885 there were of all kinds reported	.	.	14,923,006
In 1886 " " " " "	.	.	9,121,410
Or a decrease of	.	.	5,801,596

This large difference would show a lamentable decline in the fisheries if the figures were derived from returns of all fisheries for the two years, but as it is evident that returns have not been received from all persons who, by law, should send them to the Commissioners, the apparent decrease may be regarded more as a decrease of honor on the part of the fishermen who do not make returns, than to a diminution in the total catch of fish. So far as the figures given in the tables are comparable with last year's returns, they show an increase in the catch of menhaden, striped bass, scup, Spanish mackerel, tautog, eels, and the several kinds in the column of "other edible fishes"; while there has been a falling off in shad, alewives, sea-herring, squeteague, mackerel, bluefish and flatfish. It is evident that the shad fisheries of the Taunton River have continued to decrease since their downward jump in 1883, while our shad fisheries of the Connecticut River have practically run out.

An accurate statement of the annual catch of fish in this State is important, and to none is it more important than to the fishermen. The reports have been called for by parties interested in the settlement of the difficulties between the States and the Dominion government.

A thorough investigation will be made as to the causes which have led to the failure in making returns, and deputies appointed to see that the law is complied with.

REPORT OF LEASED PONDS.

Up to the present time less than one-half of the returns from leased ponds have been received.

Of these returns many show an increase of catch over preceding years. Others are entirely worthless and give little or no reliable information in regard to the condition of the ponds over which the parties have control.

The United States and almost every State and Territory in the Union has its Commissioners on Fisheries, and the cultivation and propagation of fish is so thoroughly understood as to leave no doubt of its value.

The able Commissioners of New York, in their report for 1886, in summing up their labors from 1868 to the present time, give the following clear statement of results:—

By examining the tables given of production and expenditure, it will be found that the cost of hatching 100,000,000 fish, including expenditures for real estate, buildings and permanent appliances, as well as labor, has been, in round numbers, \$250,000. This is one-quarter of a cent for each fish produced. Estimating that of the fish planted, one-fourth only (which is a very small proportion) live to maturity, we have 25,000,000 of fish, costing one cent each. The lowest estimate that should be put on the value of these fish for market is an average of fifteen cents. Thus the public has a return for the money appropriated for artificial fish culture of fifteen hundred per cent, or for the expenditure of \$250,000 a return of \$3,750,000 in production.

If there is any other industry fostered by the State government that pays like this, let it be demonstrated.

INSECTIVOROUS BIRDS.

The Legislature of the present year, by chapter 276, invested this Commission with the duty of better preservation of birds.

The great destruction of singing and insectivorous birds, for merchandise and millinery purposes, threatens ultimate disaster to the farmer and fruit grower.

The agitation of the question before the Legislature last winter, and its wide publication by the press, has already done great good, as your Commission finds in its investigation of the matter. The few months during which the law has been in force is not sufficient to demonstrate fully its usefulness, but by a year or two of enforcement its wisdom will be demonstrated.

The permits to shoot song and insect-eating birds, granted so lavishly and unwisely under the old law, are by the new statute made void.

The following shows the only permits now in force and the persons to whom they are granted; all of them being men actually engaged in the study of ornithology, and who will not, in our judgment, abuse the privilege:—

J. Ellis Cabot, Brookline, for 1886.

William Brewster, Cambridge, 1 year from Dec. 10, 1886.

Arthur P. Chadbourne, “ “ “ “ “

Henry A. Purdy, Newton, “ “ “ “

In discharging the duties assigned us we have received, during the year, valuable assistance from the Massachusetts Fish and Game Protective Association, whose labors are largely devoted to the protection of Insectivorous Birds, a statement of which will be found in the Appendix.

E. A. BRACKETT.

F. W. PUTNAM.

E. H. LATHROP.

EXPENDITURES OF COMMISSION.

Salary,	\$1,650 00
Travelling and other expenses,	270 27

GENERAL EXPENDITURES.

Labor at Lawrence fishway,	\$70 00
Seine and twine,	31 73
Expressage,	28 70
Rent of land,	50 00
Printing,	55 71
Advertising,	94 01
Attorney's services,	18 00
Subscription to Penobscot salmon-breeding establishment,	500 00
" Schoolic salmon-breeding station,	300 00
B. P. Chadwick, services,	85 00
expenses,	21 51
E. F. Hunt, services,	280 00
expenses,	40 17
W. H. Means, services,	30 00
expenses,	2 19
Lumber,	89 23
Work on pond and dam,	169 18
Mowing brush,	1 75
Bread and meal,	24 50
Nails,	6 30
Iron-work,	22 55
Cement,	1 00
Labor at State hatching-house,	195 00
Felt for roofing,	6 00

 \$1,042 80
Joint Hatchery at Livermore Falls.

E. B. Hodge, superintendent,	\$300 00
Net rings and weir screens,	17 74
Rendrock and cement,	1 62
Insurance,	5 00
Brook trout,	11 25
Fish meat,	27 22
Papering,	7 00
Carting lumber,	0 50
Assistant's services,	67 00
Rent,	25 00
Planting salmon fry,	9 75
	<hr/>
	\$472 08
	<hr/>
	\$1,514 88

APPENDIX.

[A.]

LIST OF FISH COMMISSIONERS AND OFFICERS.

[Revised and corrected to Sept. 1, 1886, by "Forest and Stream."]

THE UNITED STATES.

Prof. Spencer F. Baird, Washington, D. C.

ALABAMA.

Col. D. R. Hundley, Madison.

Hon. Charles S. G. Doster, Prattville.

ARIZONA.

J. J. Gosper, Prescott.

Richard Rule, Tombstone.

J. H. Taggart, Business Manager, Yuma.

ARKANSAS.

James H. Hornibrook, Little Rock.

H. H. Rottaken, Little Rock.

[These were the officers last year; we have not been able to get replies from them.]

CALIFORNIA.

R. H. Buckingham, President, Sacramento.

Hon. A. B. Dibble, Secretary and Treasurer, Grass Valley.

Thos. J. Sherwood, Marysville.

CANADA.

Hon. John Tilton, Deputy Minister of Fisheries, Ottawa, Ont.

PROVINCE OF NEW BRUNSWICK.

W. H. Venning, Inspector of Fisheries, St. John.

PROVINCE OF NOVA SCOTIA.

W. H. Rogers, Inspector, Amherst.

A. C. Bertram, Assistant Inspector, North Sydney.

PROVINCE OF PRINCE EDWARD ISLAND.

J. H. Duvar, Inspector, Alberton.

PROVINCE OF QUEBEC.

W. Wakeham, Inspector Lower St. Lawrence
and Gulf Division, Gaspé Basin.

PROVINCE OF BRITISH COLUMBIA.

Thos. Mowat, Acting Inspector, New Westminster.

PROVINCE OF MANITOBA AND NORTHWEST TERRITORIES.

Alex. McQueen, Inspector, Winnipeg, Man.
S. Wilmot, Supt. of Fish Culture, Newcastle, Ont.

COLORADO.

John Pierce, Denver.

CONNECTICUT.

Dr. Wm. M. Hudson, Hartford.

[Term expires Aug. 26, 1889.]

Robert G. Pike, Middletown.

[Term expires March 8, 1889.]

James A. Bill, Lyme.

[Term expires Aug. 26, 1887.]

DELAWARE.

Enoch Moore, Wilmington.

[Term expires April 23, 1887.]

GEORGIA.

Hon. J. T. Henderson, Commissioner of Agri-
culture, Atlanta,

Dr. H. H. Cary, Supt. of Fisheries, LaGrange.

[Under the laws of the State these constitute the Board of Fish Com-
missioners.]

ILLINOIS.

N. K. Fairbank, President, Chicago.

S. P. Bartlett, Secretary, Quincy.

Maj. Geo. Breuning Centralia.

INDIANA.

Enos B. Reed, Indianapolis.

[Term expires in 1887.]

IOWA.

E. D. Carlton, Spirit Lake.

KANSAS.

S. Fee, Wamego, Pottawatomie Co.

KENTUCKY.

Wm. Griffith, President, Louisville.
 P. H. Darby, Princeton.
 John B. Walker, Madisonville.
 Hon. C. J. Walton, Munfordville.
 Hon. John A. Steele, Midway.
 W. C. Price, Danville.
 Dr. W. Van Antwerp, Mt. Sterling.
 Hon. J. M. Chambers, Independence, Kenton Co.
 A. H. Goble, Catlettsburg.
 J. H. Mallory, Bowling Green.

MAINE.

E. M. Stilwell, Commissioner of Fish and
 Game, Bangor.
 Henry O. Stanley, Commissioner of Fish and
 Game, Dixfield.
 B. W. Counce, Commissioner of Sea and Shore
 Fisheries, Thomaston.

MARYLAND.

G. W. Delawder, Oakland.
 Dr. E. W. Humphries, Salisbury.

MASSACHUSETTS.

E. A. Brackett, Winchester.
 F. W. Putnam, Cambridge.
 E. H. Lathrop, Springfield.

MICHIGAN.

Dr. J. C. Parker, Grand Rapids.
 John H. Bissell, Detroit.
 Herschel Whitaker, Detroit.
 W. D. Marks, Superintendent, Paris.
 A. J. Kellogg, Secretary, Detroit.

MINNESOTA.

1st District — Daniel Cameron, La Crescent.
 2d District — Wm. M. Sweeney, M. D., . . . Red Wing.
 3d District — Robt. Ormsby Sweeny, President, Paul.
 S. S. Watkins, Superintendent, Red Wing.

MISSOURI.

J. G. W. Steedman, M.D., . . . 2,803 Pine Street, St. Louis.
 Gen. J. L. Smith, Jefferson City.
 H. M. Garliech, St. Joseph.

NEBRASKA.

W. L. May, Fremont.
 R. R. Livingston, Plattsmouth.
 B. E. B. Kennedy, Omaha.

NEVADA.

W. M. Cary, Carson City.

NEW HAMPSHIRE.

George W. Riddle, Manchester.
 E. B. Hodge, Plymouth.
 John H. Kimball, Marlborough.
 E. B. Hodge, Superintendent.

NEW JERSEY.

Richard S. Jenkins, Camden.
 William Wright, Newark.
 F. M. Ward, Newton.

NEW YORK.

Hon. R. Barnwell Roosevelt, President, 17 Nassau St., New York.
 Gen. Richard U. Sherman, Secretary, New Hartford, Oneida Co.
 Eugene G. Blackford, Fulton Market, N. Y.
 William H. Bowman, Rochester.
 Seth Green, Superintendent, Rochester.
 Fred Mather, Superintendent, Cold Spring Harbor.
 Monroe A. Green, Superintendent, . . . Mumford, Monroe Co.
 F. A. Walters, Superintendent, . . . Bloomingdale, Essex Co.
 H. H. Thompson, Secretary, . . . P. O. Box 25, New York City.

NORTH CAROLINA.

[A note from Col. M. McGehee, Raleigh, the former Commissioner, under date of August 9, says: "There is no Fish Commissioner in the service of this State."]

OHIO.

Col. L. A. Harris, President,	.	.	.	Cincinnati.
George Daniels,	.	.	.	Sandusky.
James Dority,	.	.	.	Toledo.
Henry Douglass, Superintendent,	.	.	.	Sandusky.

[No information furnished; the names are those of last year.]

PENNSYLVANIA.

John Gay, President,	.	.	.	Greensburg.
H. H. Derr, Secretary,	.	.	.	Wilkesbarre.
Arthur Maginnis,	.	.	.	Swift Water, Monroe Co.
A. M. Spangler, Corresponding Secretary,	512	Commerce St.,	Phil.	
Aug. Duncan, Treasurer,	.	.	.	Chambersburg.
Chas. Porter,	.	.	.	Corry.

RHODE ISLAND.

John H. Barden,	.	.	.	Rockland.
Henry T. Root,	.	.	.	Providence.
Wm. P. Morton,	.	.	.	Providence.

SOUTH CAROLINA.

Hon. A. P. Butler, Commissioner of Agriculture,	Columbia.
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TENNESSEE.

W. W. McDowell,	.	.	.	Memphis.
H. H. Sneed,	.	.	.	Chattanooga.
Edward D. Hicks,	.	.	.	Nashville.

VERMONT.

Hiram A. Cutting,	.	.	.	Lunenburg.
Herbert Brainerd,	.	.	.	St. Albans.

VIRGINIA.

Col. Marshall McDonald,	.	.	.	Berryville.
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WASHINGTON TERRITORY.

Albert T. Stream,	.	.	.	North Cove, Pacific Co.
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WEST VIRGINIA.

C. S. White, President,	.	.	.	Romney.
W. A. Manning, Secretary,	.	.	.	Talcott.
F. J. Baxter, Treasurer,	.	.	.	Braxton Court House.

[Terms expire June 1, 1889.]

WISCONSIN.

The Governor, *ex officio*.

Philo Dunning, President,	. . . . .	Madison.
C. L. Valentine, Secretary and Treasurer,	. . . . .	Janesville.
J. V. Jones,	. . . . .	Oshkosh.
A. V. H. Carpenter,	. . . . .	Milwaukee.
Mark Douglass,	. . . . .	Melrose.
Calvert Spensley,	. . . . .	Mineral Point.
James Nevin, Superintendent,	. . . . .	Madison.

WYOMING TERRITORY.

Otto Gramm, Laramie.

[Dr. W. N. Hemt, Cheyenne, is Commissioner for Laramie County, and
B. F. Northington, Rawlins, is Commissioner for Carbon County.]

[B.]

LIST OF PONDS LEASED

*By the Commissioners on Inland Fisheries, under Authority given by Chap. 384, Sect. 9, of the Acts of 1869.**

[Those marked by a * have made the required returns.]

1870.

- Feb. 1. Waushakum Pond, in Framingham, to Sturtevant and others, 20 years.
- April 1. Mendon Pond, in Mendon, to Leonard T. Wilson and another, 20 years.
- Sept. 12. Baptist Lake, in Newton, to J. F. C. Hyde and others, 20 years.

1871.

- April 17. Long Pond, in Falmouth, to Joshua S. Bowerman and three others, 20 years.
- May 15. Pratt's Pond, in Upton, to D. W. Batcheller, 20 years.
- Nov. 1. Punkapoag Pond, in Randolph and Canton, to Henry L. Pierce, 20 years.

1872.

- Jan. 1. * Sandy Pond, Forest Lake, or Flint's Pond, in Lincoln, to James L. Chapin and others, 20 years.

1873.

- May 1. * Meeting-house Pond, in Westminster, to inhabitants of Westminster, 15 years.
1. Great Pond, in Weymouth, to James L. Bates and others, 15 years.
- July 1. * Little Sandy Pond, in Pembroke, to A. C. Brigham and others, 16 years.

* We would remind lessees of ponds that they are required, by their leases, to use all reasonable efforts to stock their ponds, and keep accurate records of the same, and make returns of their doings to the Commissioners on the *1st of October*, each year, of the number and species of fish which they have put in or removed from their ponds. Any failure to comply with these conditions is a breach of contract invalidating their lease. It is important that the State should know just what is being done; and, where there appears to be mismanagement or apparent failure, the Commissioners will visit the ponds, and ascertain, if possible, the cause.

1873.

- Sept. 1. Pontoosuc Lake, in Pittsfield and Lanesborough, to E. H. Kellogg and others, 15 years.
- Oct. 1. Farm Pond, in Sherborn, to inhabitants of Sherborn, 15 years.
1. Spot Pond, in Stoneham, to inhabitants of Stoneham, 15 years.
- Dec. 1. Lake Wauban, in Needham, to Hollis Hunnewell, 20 years.

1874.

- March 1. Walden and White ponds, in Concord, to inhabitants of Concord, 15 years.
2. Upper Naumkeag Pond, in Ashburnham, to inhabitants of Ashburnham, 20 years.
- April 1. Elder's Pond, in Lakeville, to inhabitants of Lakeville, 15 years.
20. North and South Podunk ponds, in Brookfield, to inhabitants of Brookfield, 15 years.
- May 1. * Maquan Pond, in Hanson, to the inhabitants of Hanson, 15 years.
20. Unchechewalom and Massapog ponds, to the inhabitants of Lunenburg, 20 years.
- July 1. Hardy's Pond, in Waltham, to H. E. Priest and others, 15 years.
1. * Hockomocko Pond, in Westborough, to L. N. Fairbanks and others, 15 years.
11. Mitchell's Pond, in Boxford, to R. M. Cross and others, 15 years.
11. Hazard's Pond, in Russell, to N. D. Parks and others, 20 years.
- Oct. 1. East Waushacum Pond, in Sterling, to inhabitants of Sterling, 20 years.
20. Middleton Pond, in Middleton, to inhabitants of Middleton, 15 years.

1875.

- Jan. 1. White and Goose ponds, in Chatham, to George W. Davis, 15 years.
- March 1. Hood's Pond, in Ipswich and Topsfield, to inhabitants of Topsfield, 15 years.
- April 1. Chauncey Pond, in Westborough, to inhabitants of Westborough, 15 years.
3. West's Pond, in Bolton, to J. D. Hurlburt and others, 15 years.
15. Gates Pond, in Berlin, to E. H. Hartshorn and others, 15 years.

1875.

- April 24. Pleasant Pond, in Wenham, to inhabitants of Wenham, 15 years.
- May 1. * Morse's Pond, in Needham, to Edmund M. Wood, 15 years.
1. * Chilmark Pond, in Chilmark, to J. Nickerson and others, agents, 20 years.
- July 1. * Winter Pond and Wedge Pond, in Winchester, to inhabitants of Winchester, 15 years.
1. * Haggett's Pond, in Andover, to inhabitants of Andover, 20 years.
- Aug. 1. * Oyster Pond, in Edgartown, to J. H. Smith and others, 20 years.
7. West Waushacum Pond, in Sterling, to inhabitants of Sterling, 20 years.
9. * Mystic (Upper) Pond, in Winchester, Medford and Arlington, to inhabitants of Winchester and Medford, 15 years.
- Oct. 1. Little Chauncy and Solomon ponds, in Northborough, to inhabitants of Northborough, 15 years.

1876.

- Feb. 1. * Great Sandy Bottom Pond, in Pembroke, to Israel Thrasher and others, 15 years.
- March 1. Dennis Pond, in Yarmouth, to inhabitants of Yarmouth, 15 years.
- March 1. * Crystal Lake, in Wakefield, to Lyman H. Tasker and others, 15 years.
20. Lower Naumkeag Pond, in Ashburnham, to inhabitants of Ashburnham, 18 years.
28. Dennison Lake, in Winchendon, to inhabitants of Winchendon, 15 years.
28. Phillipston Pond, in Phillipston, to inhabitants of Phillipston, 20 years.

1876.

- May 8. South-west Pond, in Athol, to Adin H. Smith and others, 15 years.
- June 1. * Norwich Pond, in Huntington, to inhabitants of Huntington, 20 years.
10. Dug Pond, in Natick, to W. P. Bigelow and others, 15 years.
- Oct. 1. Farm and Learned's Pond, in Framingham, to inhabitants of Framingham, 15 years.
1. Whitney's Pond, in Wrentham, to inhabitants of Wrentham, 15 years.
1. Little Pond, in Barnstable, to George H. Davis, 15 years.

1877.

- March 1. * Nine-Mile Pond, in Wilbraham, to inhabitants of Wilbraham, 15 years.
 15. Pentucket and Rock Ponds, in Georgetown, to inhabitants of Georgetown, 15 years.
 Aug. 10. * Onota Lake, in Pittsfield, to William H. Murray and others, 15 years.
 Oct. 1. Fort, Great Spectacle, and Little Spectacle ponds, in Lancaster, to inhabitants of Lancaster, 20 years.
 Nov. 1. Tispaquin Pond, in Middleborough, to Abishai Miller, 15 years.

1878.

- Jan. 1. * Sniptuit, Long, Snow, and Mary's ponds, in Rochester, to inhabitants of Rochester, 15 years.
 March 16. Asnaconcomic Pond, in Hubbardston, to Amory Jewett, Jr., 15 years.
 April 1. Dorrity Pond, in Millbury, to inhabitants of Millbury, 10 years.
 May 1. * Bear Hill Pond and Hall Pond, in Harvard, to inhabitants of Harvard, 15 years.
 5. * Spectacle, Peters, and Triangle ponds, in Sandwich, to George L. Fessenden, 10 years.
 Oct. 1. * Ell Pond, in Melrose, to J. A. Barrett and others, 15 years.
 1. Accord Pond, in Hingham, South Scituate, and Rockland, to inhabitants of those towns, 10 years.
 1. Wright's and Ashley's ponds, in Holyoke, to Henry C. Ewing and others, 10 years.
 1. * Magog Pond, in Acton and Middleton, to inhabitants of Acton, 15 years.

1879.

- Feb. 1. * Lake Mahkūnac and Lake Overic, in Stockbridge, to inhabitants of Stockbridge, 10 years.
 July 1. Silver Lake, in Wilmington, to inhabitants of Wilmington, 10 years.
 1. * Fresh Pond, in Falmouth, to Thomas H. Lawrence, 20 years.
 Oct. 1. * Pomp's Pond, in Andover, to inhabitants of Andover, 15 years.
 Nov. 1. * Lake Quinapowitt, in Wakefield, to inhabitants of Wakefield, 14 years.

1880.

- March 1. * Lake Winthrop, in Holliston, to inhabitants of Holliston, 15 years.
 15. Massapoag Pond, in Sharon, to inhabitants of Sharon, 10 years.

1880.

- May 1. * Tisbury Great Pond, in Tisbury, to Allen Look and others, 10 years.
- June 1. * Indian Pond, in Kingston, to inhabitants of Kingston, 10 years.
1. * Jordan Pond, in Shrewsbury, to inhabitants of Shrewsbury, 15 years.
- July 1. * Swan and Martin's ponds, in North Reading, to inhabitants of North Reading, 15 years.
- Sept. 1. Herring Pond, in Eastham, to William H. Nickerson, 10 years.
- Dec. 24. Chadwick's Pond, in Bradford and Boxford, to town of Bradford, 10 years.

1881.

- Jan. 1. * Great and Job's Neck ponds, in Edgartown, to Amoz Smith and others, 15 years.
- March 1. * The Mill Ponds (three), in Brewster, to Valentine B. Newcomb and another, 15 years.
- April 1. * Long Pond, in Blandford, to Samuel A. Bartholomew and another, 15 years.
- May 2. * Nonesuch Pond, in Weston and Natick, to W. A. Bullard and others, 15 years.

1882.

- March 1. Blair's Pond, in Blandford, to Curtis M. Blair and another, 15 years.
- April 1. * Ward Pond, *alias* Wightman Pond, in Ashburnham, to Herbert F. Rockwood and another, 15 years.
- May 1. Horn Pond, in Woburn, to inhabitants of Woburn, 15 years.
- June 1. Wickaboag Pond, in West Brookfield, to inhabitants of West Brookfield, 15 years.

1883.

- March 1. Halfway Pond, in Plymouth, taken by Commissioners for 5 years, in accordance with provisions of chap. 62, Acts of 1876.
- April 6. * Fresh Pond, in Tisbury, to Allen Look and others, 15 years.
23. * Keyes Pond, in Westford, to M. H. A. Evans, 15 years.
- May 7. Singletary Pond, in Sutton and Millbury, to towns of Sutton and Millbury, 15 years.
7. The Great Pond, in Ashfield, to town of Ashfield, 15 years.
- July 1. Lake Buell, in Monterey and New Marlborough, to town of New Marlborough, 10 years.

1884.

- June 1. * Bald Pate, Four-mile, and Stiles ponds, in Boxford, to inhabitants of Boxford, 10 years.
- July 15. * Asneybunskeit Pond, in Paxton, to inhabitants of Paxton, 10 years.
15. Center Pond, in Dennis, to inhabitants of Becket, 10 years.
15. Buckmaster Pond, in Dedham, to Francis Soule and others, 10 years.
15. * Fresh Pond, in Dennis, to inhabitants of Dennis, 10 years.
17. * Farm Pond, in Cottage City, to John C. Hamblin and others, 15 years.
18. Mashpee, Great, and Wakeley ponds, in Mashpee, to inhabitants of Mashpee, 10 years.
- Aug. 30. * Sand Pond, in Ayer, to inhabitants of Ayer, 15 years.
- Sept. 5. Great Pond, in North Andover, to inhabitants of North Andover, 15 years.

[C.]

CONNECTICUT RIVER.

[From Massachusetts Report, 1878.]

The extraordinarily bad season of 1877 in the Connecticut River brought the diminution of shad to such painful notice, that our Legislature passed resolves calling the attention of Connecticut to the fact. By invitation of the Committee on Fisheries of the Connecticut Assembly, the Massachusetts Commissioners on Inland Fisheries appeared on the 26th of February, 1878, and made the following statement :—

Mr. Chairman and Gentlemen of the Committee on Fisheries.

We come before you, on your invitation, not as advocates or as witnesses, but as State officers, to make such statements and explanations as may be called for by the recent resolves of the Legislature of Massachusetts touching the exhaustion of the shad fisheries in the Connecticut River ; and we propose very briefly to consider each paragraph in this document. The preamble begins :—

Whereas, The Connecticut River formerly abounded in shad and salmon, which had much diminished, however, in recent times, by reason of excessive fishing and impassable dams.

The truth of this statement is so generally acknowledged that it need not delay us. At the close of the last century salmon and shad were still very abundant in the Connecticut, and the former were often sold at 50 cents each. The salmon penetrated to the head-waters, and spawned in Israel's River and the Upper and Lower Ammonoosucks. The shad penetrated only to Bellows Falls, which they could not surmount. They passed Turner's Falls, however, in great numbers ; and as many as 5,000 in a day have been taken with dip-nets from a single rock at this point. In 1798 a high dam erected just below the mouth of Miller's River shut the salmon from their spawning-grounds, and practically exterminated them within a dozen years. The shad, breeding in all the lower waters, continued in plenty until 1849, when the erection of an

impassable dam at Hadley Falls seriously curtailed their numbers. This will be treated more fully under another head. The preamble continues :—

Whereas, The State of Massachusetts, as well in a spirit of comity for neighboring States as for the benefit of her own citizens, has appointed Commissioners on Inland Fisheries, and has expended large sums of money in building fishways, in hatching shad, and in seeding the river with great numbers of young salmon, whereby shad were at one time restored to their ancient abundance, and whereby there is now a good hope of restoring salmon to the river.

The origin of our Commissioners on Inland Fisheries did not spring from a desire to increase our own wealth, but entirely from a wish to render justice to our sister States, Vermont and New Hampshire; the latter of which passed in 1864 a resolve which recited that, “whereas the rivers and lakes of this State were wont formerly to furnish an inexhaustible supply of salmon, shad, and other migratory fish, which have now entirely disappeared from our waters; and whereas there is nothing to prevent the return of such fish but the want of suitable fishways over the dams across the Connecticut, Merrimack, and Saco, and other rivers, and in such numbers as to contribute very largely to the supply of wholesome and agreeable food for the inhabitants of this State: therefore, resolved, that the attention of the State of Massachusetts, Connecticut and Maine be invited to this subject, and that they be earnestly requested to take early measures to cause such fishways to be constructed . . . as due alike to the relations of comity between those States and our own, to the obligations of national law, and to the interest of those States themselves.”

In March, 1865, a joint committee of the Massachusetts Legislature held a hearing for the parties in interest; and, on their recommendation, two Commissioners were appointed the following summer, to investigate and report on the subject. At the following session, the Legislature established the Commissioners for five years, and made an appropriation of \$7,000; in 1867 the appropriation was \$10,000; and annual appropriations have been since continued, never of less than \$2,500, and usually of \$5,000. During the twelve years of their service the Commissioners have steadily borne in mind the original object of their appointment, and have striven to free the Merrimack and Connecticut from obstruction. Although the legislative committee and two successive attorneys-general opined that the Holyoke Water Power Company was exempt from putting a fishway in their dam, the Commissioners held a different view, and sued the company in the name of the State. The case was tried by the Supreme Court, and appealed to that of the

United States, where the decree was affirmed; and the company was compelled to build a fishway on the most approved model, and at a cost of about \$30,000. As early as 1867 Seth Green was employed by the Commissioners to attempt the artificial hatching of shad at Hadley Falls. He was entirely successful; and the operation has been since continued by Massachusetts or Connecticut, or by the United States. Of the effects of this artificial propagation we do not propose to speak dogmatically, but to give some facts and reasons that may perhaps indicate those effects. The closing of the Holyoke or Hadley Falls dam in 1849 was, for reasons which will be considered further on, a severe injury to the shad fisheries; indeed, the injury to fisheries *below* the dam was a point which had escaped lawyers, and was one of the main grounds of the decision which compelled the company to build a fishway. The statistics of Parsonage Pier in Connecticut fishery show this very distinctly. The average catch there for the ten years from 1827 to 1836 was 10,376; for the next ten years, 9,332, showing a slight decline, attributable perhaps to increase of population and fishing. For the five years after the closing of the Holyoke dam, 1849-53, the average rose suddenly to 19,490. For the next ten years, 1854-63, it as suddenly fell to 8,364; and for the following six years, 1864-69, it further decreased to 4,482, less than one-half its first yield. The closing of Holyoke dam shut back all the shad that had frequented the *upper* spawning-beds; and they retreated in confusion down the river, and were taken in plenty. Alewives have conducted themselves in the same way in other streams. It takes three years for a shad to attain the merchantable size, and about five years for its maximum growth. When the dam was closed, there were in the river the *full-grown* fish (some of which had bred in the upper ground), and there were four successive crops of *younger* fish, the last of which would not get their full growth for four years. The unusual abundance would last so long as the column was annually recruited by the younger generations, which would be for five seasons. After that the crop of the lower stream would sink to that of the spawning-beds, which still were accessible.

Returns from another pier fishery for a less number of years (1851-68) give substantially the same results. In 1851 the catch was 15,942; the average of the next nine years was 6,765; and, of the last eight years, only 5,448. On the whole, then, there was a decrease, and a *continuous* decrease, from the closing of the Holyoke dam — and perhaps before that date — to the year 1868. That season was unusually poor for shad-fishing all along the coast of the Northern and Middle States; but, in apparent contradiction,

the Connecticut River teemed at all points with little yearling shad. Next season (1869) larger fish, of two years old, were in great plenty. On Sunday, May 21, 1870, vessels in Long Island Sound observed vast shoals of shad. The next day they struck in, at and about the mouth of the river, and filled the nets. The total yield of the pounds that day was reported over 25,000. At Haddam Island, in the river, 700 were taken at one sweep of the seine, which was more than one-third the yield of a similar seine for the whole of the previous season. The Hudson on the west, and the Merrimack on the east, showed no unusual catch; indeed, the phenomenon was a local one, confined to the Connecticut. The whole effect may not be due to Green's propagation in 1867, because in 1868 Connecticut forbade any mesh smaller than five inches, whereas a two and one-half inch mesh had before been used; and, furthermore, a "close time" of thirty-six hours a week was ordered. The result was that the yearlings and two-year-olds escaped through the meshes, and swelled the catch of large fish in the following years. Nevertheless a part of the increase may reasonably be laid to the artificial propagation, whose tendency seems to be to counteract the natural *decrease* in our fisheries, even if it does not cause an *increase*. The following statistics of the best fishery within the Massachusetts line may illustrate the point.

Hadley Falls Shad Fishery Statistics — 1868-1877.

YEARS,	1868.	1869.	1870.
Gross catch for each year,	7,341	8,807	11,618
Date of taking first shad,	May 6.	May 13.	May 6.
Number of days in fishing season, .	40	33	40
Average number of fish a day, . .	183	267	290

1871.	1872.	1873.	1874.	1875.	1876.	1877.
10,634	7,691	7,294	15,057	9,135	10,741	2,674
May 1.	May 11.	May 14.	May 13.	May 18.	May 22.	May 14.
44	45	35	37	38	33	42
241	170	208	407	240	325	63

Total catch for ten years, 1868-77,	90,992
Yearly average for the ten years,	9,099
Yearly average for first five years,	9,220
Yearly average for second five years,	8,980
Daily average for ten years,	239
Daily average for first five years,	230
Daily average for second five years,	248

Previous to this period, and posterior to the closing of the Holyoke dam, the catch had been much larger. In 1865 it was estimated at 35,000, and in 1853 at 45,000.

Hence we draw the conclusion that a cause has been at work to keep up the fishery at this point, because, with the exception of the last season, it has maintained a pretty uniform average for ten years since 1868, before which time it had much decreased; and such cause we find in artificial propagation conducted on this very fishing-ground, whose fish would return, as is well known, to the spot on which they were bred. In 1874, 800,000 young salmon were put in the Connecticut River, of which 271,000 were contributed by Massachusetts. If such success crowns this as that of the Merrimack, next spring (1878) will see a large number of salmon, weighing from ten to fifteen pounds, endeavoring to force the mouth of the river, and mount to their spawning-grounds once more, after an interval of nearly a century. They will meet no impediments north of the Massachusetts line. The dams at Holyoke and at Turner's Falls are furnished with the same fishway that last season carried every salmon over the great Lawrence dam. It is for Connecticut to consider whether her laws and her modes of fishing are such as to allow fair passage to this valuable fish. There is no reason why the river should not furnish annually 100,000 pounds of salmon, without lessening the other fisheries.

The preamble continues:—

Whereas, The State of Connecticut has, in like manner and for similar purposes, expended money, and appointed commissioners who have diligently performed their duties, and have made wise plans, in agreement with their fellow-commissioners of Massachusetts, for increasing and maintaining the river fishes.

The appointment of Fishery Commissioners in Connecticut was nearly contemporaneous with that in Massachusetts. Of the Connecticut Commissioners, two have been in service about nine years, and the third seven years; a good indication of their acceptable conduct. Of the Massachusetts Commissioners, one has served since the first appointment in 1865, one nine years, and the third five years. Eleven years ago, in 1867, the Commissioners of the

New England States arranged informal meetings for consultation from time to time. In that entire period there has been no important difference of opinion among them as to the methods best to be pursued, or the laws to be enacted. The Commissioners from Connecticut and Massachusetts were often, from their position, the most nearly connected. It was by their agreement that Connecticut passed the *conditional* Act of 1867 (chap. 106, May session), by which a "close time" for pounds and nets was ordered, from Saturday night to Monday morning of each week; and the mesh of weirs was put at five inches. This act being conditional on the passage of a similar one by Massachusetts, that State passed the necessary law at the next session of its Legislature; and it is safe to say, that had it remained on the statute-books, and been honestly enforced from that day to this, the river would have abounded in shad, and the fishermen would have been much better off than now they are. It has already been stated that the shad-hatching at Holyoke, and the introduction of salmon fry in the upper Connecticut, have been undertaken by both States, acting under agreement.

The preamble finishes thus:—

Whereas, Certain persons in the State of Connecticut have fished and still continue to fish in improper ways and at improper times, in opposition to the advice of the commissioners of said State, and in violation of agreements with them made, so that only a few shad escape, and arrive at their spawning-beds, of which the greater part are in the State of Massachusetts; and so that the fisheries in Massachusetts are no longer profitable, and so that the number of spawning shad which escape is not enough to keep up the supply in the river.

It is not easy to agree what is an "improper way and improper time" of taking fish; although we may say in general that any way or time is improper that does not leave enough to renew the crop. The difficulty of decision was well exhibited at the hearing at Hartford in 1867, at which the Massachusetts Commissioners were present by invitation. There was a great mass of testimony from fishermen. The pound-owners averred that sweep-seining was very destructive to shad, but that pounds actually increased them, by capturing many sharks and other predatory animals. The gill-netters said the pounds destroyed all the young fish, but that gill-nets could only be used a small part of the time, and did much good by catching spawn-eating eels. Finally, the sweep-seiners said their nets only made a sweep or two, and then left the channel free, while the gill-nets constantly vexed the stream, and killed more fish than they caught. Not even on such a question as the

direction of run of the shad could these men, some of whom had fished for seventy years, be brought to agree; for, whereas many were sure the shad came from the direction of Montauk Point, and consequently were taken only on the east sides of the pound, others were equally sure that they came through Hell Gate, or, at any rate, from the westward, and were taken on the west sides.

With the desire of getting reliable information, the Commissioners of Connecticut and Massachusetts visited the pounds set in the Sound, west of the river's mouth, on May 20, 1868, and May 25, 1869. On the first occasion, 26 pounds were found between Saybrook Light and Mononnessuc Point, a distance of about ten miles. Some of these extended about a mile into the Sound, and were furnished with two bowls, one at the end, and the other midway. The pound selected for a test was, in each case, set with a 2½-inch mesh; but the results were quite different. The Westbrook pound of 1869 contained some 6,000 or 7,000 fishes in all, among which were a considerable number of large shad, but few small shad, with a mass of menhaden and alewives, and a few sea-herring, tautog, weak fish, rays, &c. The Saybrook pound of 1868 was estimated to contain some 20 barrels of fishes. Of these, about 70 were marketable shad; some 1,500 were young shad, fit only to be packed as herring, or sold for manure; and the rest were miscellaneous fishes, as before, but without menhaden. In neither case were there any sharks. The two drawings, on different years and in different places, but at the same season, showed that the pounds sometimes took large quantities of young shad, and sometimes few or none. Had they *always* taken young shad in the proportion observed in 1868, it was estimated that these pounds would, in one season, have destroyed 3,822,000 immature shad. But the second experiment served to show that the destruction, though probably considerable, was much below these figures. Furthermore, the careful experiments conducted with a Massachusetts pound in 1871 proved that if properly placed, set with a proper mesh, and closed during a certain time each week, a pound may be an unobjectionable mode of fishing. Indeed, Mr. Milner, a man of great experience, approves it, under certain circumstances, but insists on a "close time" of 2½ days each week. It is scarcely necessary for us to bring proofs that certain persons in this State fish in a way not approved by its Commissioners, who have always been in favor of limitations on pounds, whose owners, on the contrary, desire to fish the whole season, and with such mesh as they like. We wish to touch as lightly as possible on the topic of violations of agreement between the Commissioners of this State

and certain fishermen ; and we will therefore simply draw attention to the following reports : 1867, pp. 4, 5, and 25 ; 1870, p. 6 ; 1871, p. 30 ; 1874, *passim*. In 1871, on p. 30, they state, in set terms, that certain poundmen were dishonest, did not observe close time, and violated their voluntary agreements. These are the deliberate statements of State officers in the discharge of their trust.

Without entering into the question of what kind of fishing is injuring the shad supply, it seems certain that the sudden increase in 1870 was temporary, although for several seasons thereafter the catch showed its beneficial influence. Still for the last three seasons, and especially for the last two, complaints of marked decrease have come from most points on the river. But the past season (1877) has been so disastrous as to attract universal attention. According to an excellent authority, Mr. O. H. Kirtland, the pounds, seines and gill-nets near the river's mouth took only from one-half to one-fourth their average catch ; while the nine Massachusetts seines yielded from one-third to one-fifth their average, and their gross catch was less than the average of the Hadley Falls seine, and less than that of the Taunton River. These facts go far to prove that not enough shad escape to keep up the race, despite the artificial propagation. That their chief spawning-beds are in fresh water, and within Massachusetts, seems demonstrated : 1st, by the testimony of observers ; 2d, by the fact that when, in 1849, the upper spawning-beds were cut off, a great reduction in numbers took place ; 3d, by the want of proper testimony to show that shad breed in salt water. On this point Professor Baird and Mr. Milner, who are high authorities, write us, under date Feb. 11, 1878, that they " do not think there is any foundation whatever as to the impression in regard to the spawning of shad in salt water. All our investigations on the Southern coast have failed to reveal spawning fish in other than fresh or perhaps very slightly brackish water."

The Resolves then follow : —

Resolved, By the Senate and House of Representatives in General Court assembled, —

1. That the attention of the State of Connecticut be invited to this subject, and that she be earnestly requested to take such action in the premises as may be due to the relations of comity between sister States, and to the interests of both.

2. That his Excellency the Governor be requested to transmit a copy of these Resolves to his Excellency the Governor of the State of Connecticut, with the request that the same may be communicated to the General Assembly of that State, now in session

Mr. Chairman and Gentlemen of the Committee, our duty ends here. It would obviously be improper for us to attempt to dictate the legislation of a sovereign State.

The Commissioners had been told that a majority of the committee were, in one way or another, interested in pounds at the river's mouth; and their conduct went far to corroborate the statement. The chairman might readily have been taken for an advocate who appeared in behalf of the poundmen; and there was, in addition, a hired attorney, who seemed to mistake the officers of a sister State for witnesses who were to be diligently cross-examined. It was obvious, from the outset, that their errand was a vain one, that no judicial proceedings could be expected, and that nothing more could be done than to lay a foundation for work at a more propitious moment.

Especial marks of incredulity were shown, when, in the statement of the Massachusetts Commissioners, the return of the salmon to the river was predicted for the following spring. But in the month of May the incredulity of the Connecticut fishermen was broken down, only to be replaced by rapacity. The adult salmon, product of the plant of 1874, did indeed enter the river's mouth, heading for its upper waters. Instantly they were set upon; and, so far as can be learned, about 500 fine fish, weighing from eight to twenty pounds each, were in the course of the season taken, and sold in the markets. Thus did four years of expectation end in disappointment; and thus was great expenditure of money, labor and skill thrown away. In marked contrast to this conduct was the strict enforcement of law in Massachusetts. A few straggling salmon succeeded in getting to the Holyoke dam, where one of them was speared. But even this single offence was not allowed to pass; and a warrant was immediately issued for the arrest of the offender. Indeed, in the matter of State comity, so far as fisheries are concerned, our Commonwealth may properly claim to have acted in good faith from the outset. When, in 1864, the Legislature of New Hampshire called on Massachusetts to take measures for the restoration of migratory fishes to the Merrimack and Connecticut, our Legislature took immediate

and earnest action ; and the large sums of money since spent by the Commonwealth for this object are a proof of honest endeavor. We cannot doubt that the people of Connecticut, once roused to a sense of the situation, will see to it that wise fishery laws are passed and enforced.

THEODORE LYMAN,

E. A. BRACKETT,

ASA FRENCH,

Commissioners on Inland Fisheries, 1878.

BOSTON, Dec. 16, 1886.

Massachusetts Commissioners on Fish and Game.

GENTLEMEN: — With pleasure I communicate to you the doings of our association during this year in the protection of fish, game and insectivorous birds. As you are aware, our society is organized and maintained entirely for the public good.

Its labors are almost wholly confined to the diffusion of knowledge on the subjects in which we are interested, and to the enforcement of the laws for the protection of the birds, etc.

During the year we have printed and distributed gratuitously many thousands of copies of our game laws in pamphlet form, and have also printed and distributed the same in poster form, and we believe that great good has thus been accomplished.

In addition to this, we have done a vast deal of other work, among which might be named the arrest and prosecution of a large number of parties who have violated the laws for the preservation of our fish, game and insectivorous birds. A large percentage of these arrests were dealers in short lobsters, and we are making every possible effort to break up the illegal traffic.

The expenses of our work are met and paid out of our own treasury, but the calls upon us this year have been very heavy, and in order to meet them we have been obliged to ask for subscriptions from our members and others. Already we have collected almost a thousand dollars, and expect to obtain ample funds for our needs.

In making prosecutions a large portion of the work done was by deputies appointed by your board, who are active members of our association. In this connection it seems to us very desirable that deputies should be appointed in all the counties, in fact, in all the towns, in the State, so that we can secure a still better protection of our game and birds, and to this end I feel confident that this association would be willing to contribute its share.

Respectfully yours,

EDWARD A. SAMUELS,

Pres. Mass. Fish and Game Protective Association.

[D.]

BELOSTOMIDÆ AND SOME OTHER FISH-DESTROYING
BUGS.

BY GEORGE DIMMOCK.

Insects are generally considered to be beneficial to fishes by furnishing them one of the most unfailing sources of food. There are, however, a few insects which are injurious to fishes, thus making an exception to the rule. DeGeer¹ published a statement, in 1774, that the larvæ of dragon-flies, or as they are sometimes called, Devil's-darning-needles (the *Libellulidæ* of naturalists), would seize and kill fishes, a statement confirmed by Dale² in 1832. Von Muetzschefahl,³ in 1778-79, mentioned several aquatic insects which attacked the perch, among them two species of water-beetles (*Dytiscidæ*) and two species of water-bugs (*Notonecta glauca*, and *Nepa linearis*—now called *Ranatra linearis*). The destruction of young fishes by water-beetles has since been noted by Elles⁴ in 1830, by Dale⁵ in 1832, and by Riley⁶ in 1885. In regard to the water-bugs, observations published within the past few years have not only confirmed the above-mentioned earlier statements, but other bugs have been discovered to attack fishes. Leidy,⁷ as early as 1847, writes that species of *Belostoma* and *Perithostoma* (*Zaita*) prey upon fishes. Glover,⁸ in 1875, states that *Ranatra quadridenticulata* and *Belostoma americanum* feed on small fishes, and that *Nepa apiculata* probably, and *Notonecta insularis* possibly, do the same. Milner,⁹ in 1876, writes that *Belostoma grande* captures and eats fishes. Miss Ormerod,¹⁰ in 1878, describes how *Ranatra linearis* attacks fishes; the same year Peck¹¹ called attention to the destruction of the eggs of carp by the same insect. Turner,^{12 13} the next year, mentions the killing of young sticklebacks in an aquarium by *Belostoma*. Leonard¹⁴ notices the showing at the Edinburgh Fisheries Exhibition in 1882 of a preparation by Hugh D. McGovern, of Brooklyn, N. Y., of a year-old trout "surmounted by the fish-eating bug, *Belostoma grandis*,"

¹ Superior figures in the text refer to the citations of literature at the end of this article.

which was in the act of killing the fish by piercing its head; and Todd,¹⁵ the same year, describes how a *Belostoma*, about three-quarters of an inch long, was seen to vanquish a fish three or four times its own length. Uhler,¹⁶ in 1884, states that *Ranatra* destroys the eggs of fishes, and sometimes attacks the young fishes themselves and sucks their blood. Writing of *Belostoma grande*, the giant species of this genus, that is found in tropical America, he states that "It is a formidable monster in the pools of Demerara, where it lurks on the bottom of the muddy pools which match its color, ever ready to grasp the unwary fish in the cruel embrace of its sharp hooked fore-legs, there to remain fixed until life becomes extinct with the outflow of its blood." This author adds, "Scarcely less rapacious are the species inhabiting the United States. One of these, *B. grisea*, is the facile master of the ponds and estuaries of the tidal creeks and rivers of the Atlantic States. Developing in the quiet pools, secreting itself beneath stones or rubbish, it watches the approach of a *Pomotis*, mud-minnow, frog or other small-sized tenant of the water, when it darts with sudden rapidity upon its unprepared victim, grasps the creature with its strong, clasping fore-legs, plunges its deadly beak deep into the flesh, and proceeds with the utmost coolness to leisurely suck its blood. A copious supply of saliva is poured into the wound, and no doubt aids in producing the paralysis which so speedily follows its puncture in small creatures."

Of easily accessible articles in which the habits and fish-eating propensities of aquatic hemiptera are noticed, probably the most interesting, on account of its popular, simple style and because it deals with American insects, is the paper by Glover⁸ in the Report of the U. S. Commissioner of Agriculture for the year 1875. This paper is entitled "Heteroptera, or Plant-Bugs," but deals with many bugs that either suck the juices from plants or animals, or that are entirely rapacious, as are most water-bugs, depending for their nutriment entirely on the blood of other animals.

The rapid extension of fish culture has called attention to the attacks made upon fishes by their enemies. It is quite likely that the requirements of fish culture itself, such, for example, as associating together in the same pond of large numbers of fishes of about the same size, has furnished conditions that have permitted the increase of the actual number of the hemiptera that prey upon them. The abundance of food for water-bugs in a pond stocked with small fishes only, and the absence of larger fishes to devour the bugs while the latter are still quite young, may both contribute to the welfare and increase of the bugs.

That the loss of fish due to these insects is considerable seems

quite probable, because, notwithstanding their secluded habits, they are not rarely to be seen about ponds, sometimes even in the act of taking fishes. The following quotation from a letter from Mr. E. A. Brackett, of Winchester, Mass., Chairman of the Commissioners on Inland Fisheries for Massachusetts, under date of Dec. 16, 1886, will illustrate this fact. He writes, "In October last, while drawing off the carp-pond, the water became very roily, and I noticed several young carp moving on the surface, sidewise, evidently propelled by some external force. With a dip-net I took these young fish out, and found that in every case they were firmly held by a water-bug. The fish were dead, and the bugs apparently had been feeding on them. I had no means of determining how many of these bugs were in the pond."

The largest, and without doubt the most dangerous to fishes, of these water-bugs are those which belong to a family called by naturalists *Belostomidae*. It is especially of these *Belostomidae* that this paper treats. In the northeastern United States the common forms of these bugs belong to the genera *Zaitha*, *Belostoma* and *Benacus*. The accompanying figure of one of the species of *Belostoma*, which genus, in the tropics, contains some veritable giants in the insect line, will give a good general idea of the form and appearance of these insects. The species figured, *B. grande*, is found in temperate and tropical parts of North America. The form of insects belonging to the genus *Belostoma* is elongated oval, and their considerably flattened form and large size serves to distinguish them from all the other before-mentioned water-bugs except those belonging to the genus *Nepa*, and from them they are easily distinguished by the fact that the body of *Nepa* terminates



Belostoma grande. — After Riley.

in a long tube formed by the apposition of two grooved appendages; through this tube the insect obtains air for breathing, while the species of *Belostoma* have no such tube. The form in *Zaitha* is like that of *Belostoma*, but the species are smaller. In *Benacus*, another closely allied genus, of which the sole species, *B. halde-manum*, is found in the United States, the femur of each fore-leg lacks the groove on its forward side, — a groove which is present in the species of *Belostoma*, and which serves for the partial reception

of the tibia when the fore-leg is folded up. The genera *Zaitha* and *Benacus* formerly were considered to be a part of the genus *Belostoma*.

Insects of the family *Belostomidae* are abundant in nearly all parts of the tropical and temperate zones of both hemispheres, except in Europe, where they are extremely rare; but, as a general rule, these insects are larger the warmer the climate in which they live. Individual specimens of *Belostoma grande* are sometimes found in tropical America which measure four inches in length, and *B. griseum*, which is found in the northern United States, attains a length of three and a half inches. The young of this species when only two days from the egg measured, according to Packard, a third of an inch in length.

The color of the species of *Belostomidae* is brown, of a greater or less depth, or of a yellowish or a greenish shade. Partially covered with mud, they are quite difficult to discover. The sexes are not easy to distinguish from one another, except that females can at times be distinguished by the eggs which they carry.

These large insects are not only provided with powerful fore-legs which they use to seize their prey, and strong, somewhat oar-shaped hind-legs for swimming; but, when full-grown, they have strong wings and are capable of long-sustained flight. By their flights, which, as in most aquatic hemiptera, take place at night, these insects pass from one pond to another. This insures them a wide distribution, and makes their extermination a difficult matter. Living, as they often do, in pools which dry out at certain seasons of the year, this provision for flight is a necessity of their existence. That these flights are often long and high is proved by the fact that the bugs have been found in the midst of large cities, far from any pond or pool, upon the roofs of three and four story blocks. It is probable that they are found in these situations from having been attracted to the reflecting surfaces of sky-lights, for it is well-known that water-beetles, with their imperfect sight, mistake large expanses of glass, such as are presented by green-houses, for sheets of water. Especially attractive, however, to these large water-bugs are electric lights, and notices have appeared in the daily press of the swarming of these, as well as of other insects, about the electric lights of cities. In flight, as Mr. Brackett states in the letter from which I have already quoted, the species of *Belostomidae* which he observed can arise directly from the surface of the water.

These insects differ, according to the species, as to their mode of egg-laying. Some, like the common *Zaitha fluminea* of our northern waters, lay their eggs on their own backs. In my collection I have a

specimen of this species which has her back almost entirely covered by a nicely-arranged layer of elongated-oval, dark-brown eggs, which number over a hundred and seventy-five. These eggs are set nicely upon one end, and placed in transverse rows, by means of a long protrusile tube, or ovipositor, which the insect can extend far over her own back. This mode of oviposition insures the safety of the eggs until the young are hatched. The eggs are fastened to the back of the mother by a very thin layer of a waterproof gum secreted by the insect. The entire layer of eggs is apt to split from the insects when they are dried, and consequently is rarely seen in collections of insects. The young bug hatches from its egg by means of cutting out a round lid from the top of the egg, and at about the time when the young brood begins to hatch the mother sheds the entire layer of eggs from her back, something as she would moult her skin during growth. It is probable that all the species of *Zuitha* carry their eggs about with them, while, on the other hand, some, if not all, the species of *Belostoma* deposit their eggs in masses, under boards and logs, near the margins of the pools which they inhabit.

The young, upon hatching from the eggs, go immediately on their predaceous course, often feeding at first on young snails. As is true of most hemiptera — the bugs properly speaking — the young differ little from the adults except in the absence of wings in the former. In *Belostoma* the young, however, have two claws on the tarsi of the fore-legs, while as adults they have only one tarsal claw in the same place. It is not certainly known, but is likely that these insects reach their full growth in a year.

In seizing upon fishes or other small animals these insects grasp their prey with their fore-feet, holding it firmly in their claws, then piercing it with their beak or proboscis; for they only suck blood, not being able, as is the case with water-beetles, to eat the whole animal. The proboscis consists of stout horny setæ or bristles which fit closely together to form a fine sucking-tube, while the exhaustion is performed by means of a muscular, extensible pharynx, or throat. As is probably the case with all carnivorous hemiptera, only living prey is acceptable to these insects. The predaceous water-bugs are said to destroy the eggs of fishes, although further confirmation of this statement is desirable.

When the water-bugs attack other animals it is noticeable that the prey dies much quicker than it would normally do from simply the loss of blood consequent upon the sucking of the bug, so it is generally supposed that these insects inject a poisonous secretion through their proboscis into the wound they make. Most of these insects inflict quite severe stings, in self-defence, if they are handled

too freely, using the proboscis for this purpose. Leidy⁷ describes the salivary glands of *Belostoma*, which are well-developed, and it is undoubtedly the secretion of these glands that poisons the prey when it is pierced by the proboscis.

As will be seen from the preceding part of this paper, the destruction of the bugs that attack fishes is not an easy matter. The water-beetles can be trapped by the use of decaying animal matter, of which they are very fond. I have seen a dead rat in a small pond surrounded by a great number of these beetles (*Dytiscidæ*), and they prefer such food to living food. On the other hand, the water-bugs will take only living food, so that their entrapping by any bait would be difficult.

The use of poison for aquatic hemiptera seems also impracticable. As hemiptera eat only liquid food which they can suck up through the fine tube of their proboscis, poison that would have any effect upon them must be a liquid, a very finely-divided substance held in suspension in a liquid, a corrosive substance that will directly attack the surface of the bug, or some substance that gives off poisonous vapors. The above remark applies to all hemiptera, but the destruction of aquatic hemiptera is still more difficult. In their case no liquid poison can be applied, because the bugs would not eat it, and because its mixture with the water would endanger the fish that it was sought to protect. For like reasons no corrosive substance or poisonous vapor is applicable. Water-bugs are so much harder than fish that nothing dissolved in the water would injure them that would not prove dangerous for the fish.

Searching for the eggs of the water-bugs might prove useful on a small scale, but would, of course, be useless for the numerous species of *Zaitha*, which lay their eggs on their own backs. If the collection of the eggs of those species which lay their eggs in masses was attempted, it might be possible to cause the insects to lay their eggs under boards placed in favorable localities in shallow water, and the eggs could be taken from beneath the boards every few days and destroyed. This mode of destroying the eggs is offered as a suggestion, not having had, to my knowledge, any trial.

Collecting the adult bugs with nets would somewhat lessen their numbers, but would only prove of value in small ponds, and even these ponds might become restocked with bugs in a single night. Capturing of migratory insects has little value in lessening their depredations, except where the capturing can be done under very favorable circumstances and over large areas of country.

Keeping fish-ponds clean will certainly be of use in restraining the depredations of water-bugs, as they prefer to live in mud and rubbish, rather than in clear water.

The introduction of some insectivorous fish that will not eat the young fishes would be the most feasible way of ridding a pond of these insect pests, but my knowledge of the habits of fishes is not sufficient for me to state whether any such fish is available for use in our fresh-water ponds. A careful study of what is known about the food of our fishes might reveal some species that would keep water-bugs exterminated from any pond into which it was introduced. Ducks are known by insect-collectors to nearly exterminate the insects from some of the ponds which were the best for the collection of water-beetles before the ducks had access to them. Uhler mentions that, in the Harris collection of insects, there is a specimen of a water-bug (*Zaitha fluminea*) bearing the label, "Found in great numbers in the stomach of a duck." But ducks might eat some of the young fishes, thus proving their uselessness for the purpose intended. Among the enemies of the *Belostomidae* may be mentioned little red mites, which are often seen attached to the joints of the bugs; but these parasites probably cause their hosts but little trouble, and could not be used in any way as a means of their destruction.

The mode of destroying the water-bugs that seems to me to be the most feasible is by the employment of the electric light, and even this method, which would only pay on a large scale, might fail to destroy a sufficient number of the bugs to be of practical value. Since the introduction of the electric light as a means of lighting streets, several notices have been published to the effect that, among other insects which are attracted to the light and sometimes swarm about in numbers, are the aquatic hemiptera. Striking against the glass which surrounds the light they fall to the ground. Collectors of insects have taken advantage of this habit of the bugs, and by waiting beneath the electric lights have enriched their collections by capturing the fallen insects. The more brilliant the light the more insects are attracted to it, and on this account the electric light has proved much more favorable for collectors than gas-lights were. If the number of bugs attracted to the electric light were found to be sufficient to make that a valuable medium for destroying them, it would be easy to contrive a trap that would retain the insects after they had fallen beneath the light. Traps constructed on a similar principle have been used by insect-collectors for a long time.

It is quite possible that an illuminated trap beneath the surface of the water would attract many more of the *Belostomidae* than does a light above the surface, for these insects do not often leave the water, apparently, except when they quit it for the purpose of migration.

In conclusion, it may be said that any practical modes of combating such insect-pests as *Belostoma* are as yet undiscovered.

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CAMBRIDGE, MASS., 20 Dec., 1886.

[E.]

LAWS AND RESOLVES, 1886.

[CHAP. 163.]

AN ACT to regulate the taking of Fish in North River in the county of Plymouth.

Be it enacted, etc., as follows :

SECTION 1. The board of selectmen of either of the towns mentioned in section four of chapter forty-four of the acts of the year eighteen hundred and eighty-one, may, at the request of any purchaser of a right to fish in said river, designate in writing the place where said right shall be exercised on that part of the river lying within the limits of such town ; and whoever, after notice of such designation, uses any seine or net for taking fish in the waters of said river, within the distance of one-third of a mile below the place so designated, shall be punished as provided in section six of said chapter.

SECT. 2. This act shall take effect upon its passage. [*Approved April 27, 1886.*]

[CHAP. 192.]

AN ACT for the protection of the Fisheries in Buzzard's Bay.

Be it enacted, etc., as follows :

SECTION 1. No person shall draw, set, stretch or use any drag net, set net or gill net, purse or sweep seine of any kind for taking fish anywhere in the waters of Buzzard's Bay within the jurisdiction of this Commonwealth nor in any harbor, cove or bight of said bay except as hereinafter provided.

SECT. 2. Any net or seine used in violation of any provision of this act, together with any boat, craft or fishing apparatus employed in such illegal use, and all fish found therewith, shall be forfeited ; and it shall be lawful for any inhabitant or inhabitants of any town bordering on said bay to seize and detain, not exceeding forty-eight hours, any net or seine found in use contrary to the provisions of this act, and any boat, craft, fishing apparatus and fish found therewith, to the end that the same may be seized and libelled if needed by due process of law.

SECT. 3. All nets and seines in actual use set or stretched in the waters aforesaid in violation of this act are declared to be common nuisances.

SECT. 4. Nothing contained in this act shall be construed to interfere with the corporate rights of any fishing company located on said bay nor in any way to affect the fish weirs mentioned in section seventy of chapter ninety-one of the Public Statutes, nor the use of nets or seines in lawful fisheries for shad or alewives in influent streams of said bay, nor to the use of set nets or gill nets in the waters of the town of Fairhaven within a line drawn from Commorant rock southwesterly to the buoy on West island rips and from thence westerly in a straight course through the buoy on West island ledge to the town line of Fairhaven.

SECT. 5. Whoever violates any provision of this act or aids or assists in violating the same shall pay a fine not exceeding two hundred dollars for each offence.

SECT. 6. District courts and trial justices shall have concurrent jurisdiction with the superior court of all offences and proceedings under the provisions of this act.

SECT. 7. All fines received under this act shall be paid one-half to the complainant and the other half to the Commonwealth. All moneys from any forfeitures incurred under this act shall inure and be paid one-fourth to the informer and one-fourth to the person filing the libel and the other half to the Commonwealth. [*Approved May 6, 1886.*]

[CHAP. 202.]

AN ACT to prohibit the Seining of Bluefish in the waters of Vineyard Sound opposite the towns of Barnstable and Mashpee.

Be it enacted, etc., as follows:

SECTION 1. Whoever in any inlet, bay or arm of the sea within three miles of the shore of Barnstable or Mashpee, or in the waters of Vineyard Sound within three miles of the shore of said towns, takes bluefish with a seine or net of any kind, or for the purpose of taking bluefish sets, stretches or draws a seine or net, shall be punished by a fine of one hundred dollars, and shall forfeit to the Commonwealth any fish so taken.

SECT. 2. One-half of the penalty collected under this act shall be paid to the person or persons making the complaint, and the remainder to the county of Barnstable. [*Approved May 13, 1886.*]

[CHAP. 234.]

AN ACT for the protection of Fish in a portion of the county of Dukes County.

Be it enacted, etc., as follows :

SECTION 1. Whoever sets or uses, or aids in setting or using any seine, mesh net or gill net for the purpose of catching any other fish than mackerel, or who shall catch and retain by such means any other fish than mackerel, in the waters of the [towns of Edgartown and Cottage City in the county of Dukes County within three miles from the shores of said towns shall be punished by a fine of not exceeding two hundred dollars, one-half of which shall be paid to the person making the complaint; and in addition, in the discretion of the court, shall forfeit to the Commonwealth all fish taken in said nets.

SECT. 2. A sheriff, deputy sheriff, constable or police officer, upon view of an offence described in the preceding section, may without a warrant arrest the offender and make complaint against him therefor.

SECT. 3. The provisions of this act shall not be construed to interfere with the rights of any person or persons referred to in section three of chapter three hundred and eighteen of the acts of the year eighteen hundred and eighty-four, nor with the corporate rights of any fishing company. [*Approved May 21, 1886.*]

[CHAP. 246.]

AN ACT to prohibit the Shooting of Wild Fowl in the waters in and around Nantucket.

Be it enacted, etc., as follows :

SECTION 1. Whoever shoots at or kills any wild fowl or any of the so called shore, marsh or beach birds from boats in the harbor and great ponds of Nantucket, and the waters in and around the islands of Tuckernuck, Muskeget and the Gravelly islands, shall be punished for each offence by a fine of twenty dollars.

SECT. 2. This act shall take effect upon its passage. [*Approved May 28, 1886.*]

[CHAP. 248.]

AN ACT relative to proceedings for violations of the terms and conditions of Leases of Great Ponds.

Be it enacted, etc., as follows :

SECTION 1. District attorneys or the commissioners on inland fisheries shall institute proceedings, in the name of the Commonwealth, against the lessees of great ponds who have failed or may hereafter fail to comply with the terms and conditions of their leases, upon the complaint of the mayor or ten citizens of any city,

the selectmen or ten citizens of any town wherein any great pond has been leased under the laws relating to inland fisheries.

SECT. 2. The provisions of section seventeen of chapter ninety-one of the Public Statutes shall not apply to great ponds that have re-vested in the Commonwealth for failure to comply with the terms and conditions of the leases of the same.

SECT. 3. So much of chapter ninety-one of the Public Statutes as conflicts with section one of this act is hereby repealed. [*Approved May 28, 1886.*]

[CHAP. 276.]

AN ACT for the better preservation of Birds and Game.

Be it enacted, etc., as follows :

SECTION 1. Whoever takes or kills a pinnated grouse at any time, or a woodcock between the first day of January and the first day of August, or a ruffed grouse, commonly called partridge, between the first day of January and the first day of October, or a quail between the first day of January and the fifteenth day of October, or a wood or summer duck, black duck or teal, or any of the so called duck species, between the fifteenth day of April and the first day of September, shall be punished by a fine of twenty dollars for every bird so taken or killed.

SECT. 2. Whoever takes or kills a plover, snipe, sandpiper, rail, or any of the so called shore, marsh or beach birds, between the first day of May and the fifteenth day of July, or a wild or passenger pigeon, or a gull, or a tern, between the first day of May and the first day of October, shall be punished by a fine of ten dollars for every bird so taken or killed.

SECT. 3. Whoever buys, sells or has in possession any of the birds or animals named in this act and protected thereby, during the time within which the taking or killing thereof is prohibited, whenever or wherever the aforesaid birds may have been taken or killed, shall be punished by a fine of twenty dollars for the birds protected by section one, and ten dollars for the birds protected by sections two and four : *provided, however,* that any person, firm or corporation dealing in game may buy, sell or have in possession quail from the fifteenth day of October to the first day of May, and pinnated grouse, wild pigeons and any of the so called shore, marsh or beach birds, or of the so called duck species, at any season, if not taken or killed in this Commonwealth contrary to the provisions of this act.

SECT. 4. Whoever takes or kills any wild or undomesticated bird not named in sections one and two, except English sparrows.

crow blackbirds, crows, jays, birds of prey, wild geese, and such fresh water and sea fowl as are not named in sections one and two, or wilfully destroys, disturbs or takes a nest or eggs of any wild or undomesticated birds, except of the birds herein exempt from protection, shall be punished by a fine of ten dollars: *provided*, that any person above the age of twenty-one years having a certificate from the game commissioners or from the president of the Boston Society of Natural History to the effect that such person is engaged in the scientific study of ornithology or collecting in the interest of a scientific institution, may take the nest and eggs of, or at any season take or kill, any undomesticated bird, except woodcock, ruffed grouse and quail; but nothing herein contained shall be construed to authorize any person to enter upon private grounds without the consent of the owner thereof for the purpose of taking nests or eggs or killing birds; and *provided, further*, that the game commissioners and the president of the Boston Society of Natural History may at any time revoke any certificate they have respectively issued.

SECT. 5. Whoever takes or kills a gray squirrel, hare or rabbit, between the first day of March and the first day of September, or within said time buys, sells, or offers for sale any of said animals, shall be punished by a fine of ten dollars.

SECT. 6. Whoever takes or kills a game bird or water fowl, hare or rabbit by means of a trap, net or snare, or by the use of a ferret; and whoever, for the purpose of taking or killing a game bird, water fowl, hare or rabbit, constructs or sets any trap, snare or net, or uses a ferret; and whoever shoots at or kills any wild fowl or any of the so called shore, marsh or beach birds with or by the use of a swivel, or pivot gun or by the use of a torch, jack or artificial light, or pursues any wild fowl with or by aid of a sailboat or steam launch, shall be punished by a fine of twenty dollars.

SECT. 7. The commissioners of inland fisheries shall be game commissioners also; and their authority, personally and by deputy, shall extend to the protection and preservation of birds and animals in like manner as to fish.

SECT. 8. It shall be the duty of every officer qualified to serve criminal processes, to arrest without warrant any person whom they shall find taking or killing, or who has in possession birds or animals contrary to the provisions of this act: *provided, however*, that persons engaged in the business of regularly dealing in the buying and selling of game as an article of commerce, shall not be arrested without warrant for having in possession or selling game at their usual places of business. Any officer who neglects or re-

fuses to enforce the provisions herein contained shall be punished by fine not exceeding twenty dollars.

SECT. 9. All fines accruing under this act, shall be paid one half to the complainant and one half to the city or town in which the offence is committed.

SECT. 10. Whoever takes, carries, sends or transports any of the birds or animals protected herein, out of this Commonwealth, the said birds or animals having been illegally taken or killed within this State, shall be punished by fine of twenty dollars.

SECT. 11. Chapter ninety-two of the Public Statutes, chapter thirty-six of the acts of the year eighteen hundred and eighty-three and all acts and parts of acts inconsistent herewith are hereby repealed. [*Approved June 10, 1886.*]

[F.]

TABLES SHOWING

RETURNS OF WEIRS, SEINES AND GILL-NETS.

TABLE I. — POUNDS AND WEIRS. — Showing the Catch of each during 1886.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alwives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Spanish Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fish.	Eels.	Other Edible Fish.
Manchester,	John G. Heath,	19	9,370	65,739	20	-	1,243	25	10,826	4	-	75	148	-	-
"	Jones Bros. & West,	-	59,500	29,275	-	-	-	-	22,065	-	-	-	-	-	-
Plymouth,	E. and J. C. Barnes,	-	98,778	-	-	-	-	-	-	-	-	-	-	-	-
Chiltonville,	A. C. Finney,	-	27,988	-	-	-	-	-	-	-	-	-	-	-	-
Dennis,	Sears Bros.,	25	-	-	-	-	-	-	5,660	-	-	70	553	-	-
"	Anthony T. Chase,	63	1,475	-	-	-	-	-	36,310	-	-	183	29	-	-
"	Zenas H. Baker,	103	24,226	-	517	-	-	1	-	-	406	2	1,970	4,630	525
West Dennis,	Wm. Chalk & Co.,	1,033	39,630	-	993	5	-	4	-	-	509	-	993	67	2,606
Brewster,	Freeman Atwood & Son,	501	2,100	-	1	4	2	-	1,041	-	1,134	300	-	-	-
"	James Eldridge,	-	-	-	-	3	-	-	1,850	-	128	-	-	-	-
W. Brewster,	J. H. Newcomb & Co.,	94	3,055	-	-	-	-	-	15,970	-	-	179	555	-	-
Truro,	Atkins, Hughes and others,	292	-	215,700	-	-	-	-	588,381	-	716	689	118,864	-	-
North Truro,	P. L. Paine & Co.,	173	20,665	333,449	576	-	115	-	63,501	-	123	82	15,690	-	321
Provincetown,	T. K. Paine,	-	-	60,000	-	-	-	-	17,957	-	-	-	5,150	-	-
"	Henry J. Lewis,	411	-	-	-	-	-	-	39,531	-	188	-	9,888	-	-
Eastham,	W. H. Nickerson,	-	-	-	-	-	-	-	348,000	-	700	-	9,200	-	-
Orleans,	Isaac Hopkins,	-	-	-	-	-	-	-	2,275	-	467	-	-	-	-
Chatham,	Middletown Weir Co.,	3,121	74,914	177,950	44	-	27	-	37,923	-	15	57	1,794	-	400

		2,130	54,414	153,375	-	-	8	2	13,193	-	-	23	1,866	-	580
"	Czar Weir Co.,	.	.	.	-	-	-	-	-	-	-	-	-	-	-
"	S. F. Bearse,	1,500	14,510	177,450	-	-	-	-	18,028	-	-	-	-	-	-
"	Alpheus Mayo,	298	-	12,710	-	3	-	-	3,578	1	754	-	-	-	7,168
"	Andrew Harding & Co.,	988	5,839	66,817	-	-	-	1	9,961	-	-	-	8	-	54
Harwich,	Cyrus Nickerson,	350	4,264	-	-	-	18,947	2	11,545	-	2,596	521	2,609	-	-
Hyannisport,	T. F. Phinney,	269	3,048	5,367	177	-	5,167	326	54	-	3,093	-	-	-	2,100
South Harwich,	D. F. Weeks & S. E. Bearse,	572	21,200	-	-	-	-	1	61	-	9	30	4,450	35	3,967
Falmouth,	Isaiah Spindel,	49	4,250	9,489	-	-	132,810	198	501	8	2,060	2,235	1,911	-	5,728
"	Prince M. Stuart,	42	13,830	-	3,523	55	70,815	283	1,102	-	1,568	757	3,274	-	6,247
Mattapoisett,	Alex. B. Bowman,	-	5,239	-	-	-	3,333	26	-	-	-	-	3,413	-	-
"	Joseph Nye,	-	15,114	-	1,534	-	12,536	198	60	-	69	340	339	34	-
"	Jerome B. Dunn,	-	17,216	-	50	-	380	49	-	-	15	303	1,546	142	-
Goswold,	Alonzo B. Veeder & Co.,	-	17	2,100	-	-	126,055	-	-	-	485	115	6,242	-	26,605
"	Charles C. Church,	27	6,000	-	365	-	80,810	8	125	-	37	-	316	-	-
"	Charles O. Allen,	4	2,950	12,100	-	-	66,058	11	10,010	-	1	1,320	4,056	-	31,541
"	Henry J. Allen & D. Bosworth,	-	-	-	-	-	228,900	35	90	-	-	-	-	-	2,400
"	Frederick A. Veeder,	2	1,400	-	-	6	177,576	39	45	-	1	113	11,570	-	48,833
"	Timothy Akin,	15	-	-	-	-	90,300	500	-	-	5	-	1,050	-	10,800
"	Peter Davis,	-	-	-	-	-	113,650	-	-	-	-	-	-	-	4,530
Fairhaven,	R. W. Pease,	-	37,891	-	-	-	132,343	162	-	-	-	1,670	3,298	-	15,000
"	Chas. H. Pease & Co.,	10	53,509	-	-	-	139,357	74	3	-	93	13,000	8,373	16	19,272
"	D. C. Potter,	3	16,491	-	-	377	11,510	5	-	-	52	379	1,009	208	-
"	D. W. Deane,	30	48,781	3,674	13,886	85	54,370	93	3	-	1,024	10,267	10,421	3,607	85,533

TABLE I. — POUNDS AND WEIRS — Concluded.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alwives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Spanish Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fish.	Bels.	Other Edible Fish.
Fairhaven,	Matthew Merry,	-	3,848	-	-	-	4,470	3	-	-	-	-	18	243	-
"	J. C. and J. J. Allen,	1	5,475	-	-	50	25,089	27	-	-	14	1,160	269	87	-
"	Samuel P. Dunn,	6	20,892	-	4,508	179	49,833	60	-	-	14	3,223	2,132	975	-
"	George Hiller and Gamons & Co.,	12	32,537	-	-	77	95,784	62	22	-	47	3,567	5,268	401	-
"	Ebenezer Mott,	-	6,948	-	318	-	7,624	4	1	-	2	2,517	3,121	744	-
Dartmouth,	Snell & Bakus,	205	37,472	-	7,650	61	1,406	73	203	-	59	208	704	-	-
"	George Priaux,	112	36,153	1,907	2,895	1	65,180	182	6	1	10	319	4,941	-	-
"	Benj. Queripel,	2,874	41,446	-	-	-	126,347	102	-	-	175	828	3,794	49	175,713
"	George A. Snell,	310	82,715	279	8,765	48	48,413	150	-	5	139	785	7,257	-	97,062
"	Joseph F. Briggs,	82	24,613	-	1,980	1,204	3,353	144	-	-	337	-	2,332	-	184
"	Manehestor & Allen,	5	2,260	-	-	-	18,950	-	110	-	-	156	1,048	-	6,252
So. Dartmouth,	Nicholas Priaux,	64	9,277	70	587	3	7,997	103	23	-	56	594	1,745	19	5,764
Chilmark,	H. O. Poole & Co.,	33	7,175	31,700	159	1	9,740	85	4,148	-	153	79	5,094	-	5,407
"	Richard Flanders & Co.,	23	7,722	2,380	-	-	13,800	18	82	-	34	31	1,650	-	-
Wood's Holl.	Lewis A. Edwards,	18	6,605	3	205	249	22,895	263	1	1	27	1,104	2,757	-	7,742
	Total,	15,874	1,012,862	1,360,684	48,910	2,412	1,956,243	3,226	1,264,245	20	17,315	47,341	261,595	11,250	572,334

TABLE II. — SALT-WATER SEINE. — Showing the Catch of each during 1886.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alwives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Spanish Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fish.	Eels.	Other Edible Fish.
Newburyport,	C. A. Caswell, . . .	-	-	138,050	-	-	-	-	-	-	-	-	-	14,805	-
Gloucester,	Benj. Brazier, . . .	34,600	-	-	-	-	-	-	47,257	1	2	-	-	-	-
Yarmouth,	P. P. Akon,	10,877	-	-	-	-	-	-	-	-	-	-	-	-	-
South Yarmouth, . . .	David S. Baker, . . .	6,750	-	-	-	-	-	-	-	-	-	-	-	-	-
Chatham,	Alvin Z. Atkins, . . .	-	-	-	-	62	-	-	-	-	50	-	-	-	-
Mashpee,	David Lovell,	-	-	-	-	-	-	-	-	-	-	-	-	548	10
Westport,	Samuel G. Allen, . . .	3,131	-	-	-	8	-	-	-	-	-	2	-	31	339
"	J. T. Lawton,	1,530	-	-	-	2	-	-	-	-	-	-	-	90	630
"	Lysander White, . . .	916	-	-	-	-	-	-	-	-	-	-	1	7	16
South Westport, . . .	Chas. F. Hitt,	627	-	-	-	-	-	-	-	-	-	-	184	294	546
"	Chas. A. Tripp, . . .	863	-	-	4	16	-	-	-	-	-	6	79	113	2,342
"	Philip S. Tripp, . . .	1,476	-	10	2	27	8	-	-	-	-	4	301	1,070	3,120
" Dartmouth,	John Medreass, . . .	22	-	12,375	-	-	11,745	26	228	6	-	364	891	-	25
Centreville,	Wm. E. Bearse, . . .	-	-	-	-	1,322	60	-	-	-	15	-	-	-	-
		22	60,770	150,435	6	1,437	11,813	26	47,485	7	67	376	1,456	16,958	7,028

TABLE III. — GILL-NETS. — Showing the Catch of each during 1886.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Spanish Mackerel.	Blue-fish.	Tautog.	Flounders and Flat-fish.	Tele.	Other Edible Fish.
Barnstable,	Herbert F. Kelley,	.	.	.	.	.	.	.	.	.	234	.	.	.	.
"	James D. Kelley,	.	.	.	.	.	.	.	.	.	688	.	.	.	.
Centreville,	William H. Hallett,	.	.	.	.	.	.	.	.	.	1,659	.	.	.	.
Provincetown,	Jesse Wiley,	.	.	.	.	.	.	.	.	.	179	.	.	.	.
"	Thomas Mayo,	.	.	106	.	.	.	.	15	.	.	.	374	.	764
"	Reuben Ryder,	.	.	.	.	.	.	.	.	.	48	.	4,775	.	.
"	Edwin Sears,	.	.	.	.	.	.	.	6,189	.	.	.	.	.	.
"	Paul L. Bangs,	.	.	.	.	.	.	.	.	.	920	.	5,274	4,675	8,502
"	James G. Rand,	.	.	.	.	.	.	.	4,408	.	198	.	.	.	.
"	Joseph E. Weeks,	.	.	.	.	.	.	.	.	.	286	.	.	.	.
"	John Freeman,	.	.	.	.	.	.	.	215	.	.	.	.	.	.
"	Joseph Sears,	.	.	.	.	.	.	.	717	.	37	.	1,323	.	.
"	Levi B. Kelley,	.	.	.	.	.	.	.	413	.	17	.	.	.	.
"	J. C. P. Havender,	.	.	682	.	.	.	.	8,137	.	.	.	1,336	.	.
"	Jonathan H. Little,	.	.	.	.	.	.	.	12	.	14	.	.	.	.
"	Herman L. Mayo,	.	.	.	.	.	.	.	1,371	.	345	.	.	.	.
Eastham,	J. Q. Hopkins,	.	.	.	.	.	.	.	.	.	784	.	.	.	.

Chatham, .	.	.	.	.	.	559	38	14	-	-	2,801	-	-	-	4	-	-	-
Warcham,	.	.	.	.	.	-	-	-	-	-	-	-	-	-	-	-	-	-
Fairhaven,	.	.	.	.	.	323,800	150	2	389	2	-	-	523	51	43	-	-	-
"	.	.	.	.	.	-	-	-	394	-	-	-	259	2	2	-	-	-
"	.	.	.	.	.	-	117	-	423	13	-	2	676	6	9	-	-	721
Westport,	.	.	.	.	.	-	-	71	-	-	-	-	325	600	-	-	-	-
Nantucket,	.	.	.	.	.	-	-	-	-	-	-	-	639	-	-	-	-	-
"	.	.	.	.	.	-	-	-	-	-	-	-	143	-	-	-	-	-
"	.	.	.	.	.	-	-	-	-	-	-	-	1,170	-	-	-	-	-
"	.	.	.	.	.	-	-	-	-	-	-	-	984	-	-	-	-	-
"	.	.	.	.	.	-	-	-	-	1	-	-	12,116	-	-	-	-	15
"	.	.	.	.	.	-	-	-	-	-	-	-	3,096	-	-	-	-	-
"	.	.	.	.	.	-	-	-	-	-	-	-	266	-	-	-	-	-
"	.	.	.	.	.	-	-	-	-	-	-	-	1,287	-	-	-	-	-
Total, . . . . .	.	.	.	.	.	323,800	805	87	1,206	16	24,278	2	26,903	663	13,136	4,675	10,002	-

TABLE IV.—CONNECTICUT RIVER SEINES.

TOWN OR PLACE.	PROPRIETOR.	Shad.
South Hadley,	C. C. Smith and others,	577
	Total,	577

TABLE V.—MERRIMAC RIVER SEINES.

TOWN OR PLACE.	PROPRIETOR.	Shad.
North Andover,	Eben Sutton,	73
	Total,	73

TABLE VI.—TAUNTON RIVER SEINES.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Striped Bass.	Other Edible Fish.
Raynham,	Gustavus King,	610	127,376	-	-
"	G. B. & E. Williams,	518	141,380	-	-
Middleborough,	Leander M. Alden,	-	161,414	-	-
Dighton,	Chas. Simmons,	700	150,000	-	-
"	Edmund Hathaway,	465	118,833	-	-
Berkley,	I. N. Babbitt,	-	110,300	-	-
"	Nicholas & Shove,	325	145,000	-	-
Somerset,	John Simmons,	2	8,387	-	700
	Total,	2,620	962,690	-	700

TABLE VII. — OTHER FRESH-WATER SEINES AND DIP-NET FISHERIES.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Eels.
West Medford, . . .	Cross Bros.,	-	110,000	
Hingham,	Thomas Weston,	-	5,790	25,275
Brewster,	J. W. Thrasher,	300	100,000	-
W. Brewster,	J. Howard Winslow,	-	87,273	-
Wellfleet,	Winslow Paine,	-	266,781	-
Mattapoisett,	A. H. Shurtleff,	-	215,491	-
Chilmark,	Estate H. M. Smith,	-	12,030	-
	Total,	300	797,365	25,275

TABLE VIII. — ADDITIONAL RETURNS.

TOWN OR PLACE.	PROPRIETOR.	Alewives.	Sea Herring.	Mackerel.	Bluefish.	Tautog.	Eels.	Other Edible Fish.
Dennis, . . .	{ Crowell's Weir Co., } { Wm. Crowell, agent. }	-	-	26,221	-	149	-	-
Wellfleet, . .	W. F. Pierce, . . .	-	-	3,700	4,255	-	-	-
Westport, . .	J. M. Sowle, . . .	-	4,000	-	-	-	320	-
Barnstable, . .	W. F. Carney, . . .	-	-	-	1,118	-	-	-
Westport, . .	Perry G. Potter, . .	157	-	-	-	-	37	296
Kingston, . .	E. Elbridge Atwood,	13,000	-	-	-	-	-	-
	Totals, . . .	13,157	4,000	29,921	5,373	149	357	296

[illegible]

REPORT

OF THE

COMMISSIONERS

ON

INLAND FISHERIES AND GAME

FOR THE

YEAR ENDING DECEMBER 31, 1887.

BOSTON :
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Commonwealth of Massachusetts.

To His Excellency the Governor and Honorable Council.

The Commissioners on Inland Fisheries and Game respectfully present their Twenty-second Annual Report : —

FISHWAYS.

An investigation of all the fishways on the Merrimac was made last June, showing that they were all in good working condition.

There has been no complaint made in regard to any of the fishways in the State, except that at Middleborough. There are decided objections to this pass, owing to the dilapidated condition of the dam and the apparent neglect of the owner to comply with repeated requests to keep it in repair. Knowing the difficulties under which he labored in consequence of the condition of the dam, the Commissioners have been lenient toward him, hoping he would see his way clear to erect a more permanent structure. As this fishway in its present condition is a serious obstacle to the fisheries of the Taunton river, prompt action in regard to it will be taken next spring.

REPORT OF FISH SEEN IN THE LAWRENCE FISHWAY IN THE YEAR 1887.

May 14. Saw the first fish, a few lampreys and suckers.

Lampreys were in the fishway a little over a month, and the run was the largest ever observed in the fishway; there were days that the fishway was crowded full of them.

Alewives appeared May 17 and ran for about a month, about the same amount as last year; there were a few days that the run was large. Suckers, chubs and small eels appeared in not very large numbers. The run of salmon, shad and black bass was as noted below.

25. One shad.

June 9. Three salmon, 10 to 20 pounds weight.

11. One salmon, 10 pounds.

15. Three salmon, 8 to 20 pounds.

16. Two salmon, 10 pounds.

17. Three salmon, 6 to 8 pounds.

- June 18. Five salmon, 6 to 20 pounds.
 23. Fourteen salmon.
 Boards were set way across the dam today, which lowered the water down to the end of the fishway, making it just right for fish to run.
 24. Five salmon, 6 to 20 pounds.
 25 to June 27, a big freshet in river.
 29. Three salmon, 6 to 20 pounds.
 30. Five salmon, 6 to 15 pounds.
- July 1. Four salmon, 6 to 15 pounds.
 2. Four salmon, 6 to 15 pounds.
 4. One shad and one black bass.
 6. One salmon.
 13. One salmon, 10 pounds.
 15. One salmon, 12 pounds.
 17. Three salmon, 8 to 12 pounds.
 18. One salmon, 12 pounds.
 19. One salmon, 12 pounds.
 20. One salmon, 15 pounds.
 29. Two salmon, 6 to 10 pounds.
 30. One salmon, 10 pounds.
- Aug. 1. One salmon, 10 pounds.
 10. One salmon, 18 pounds.
 12. One salmon, 15 pounds.
 15. One black bass.
 19. One black bass.
- Sept. 8. One black bass.
 9. One salmon, 12 pounds.

No more fish, excepting a few suckers, chubs and small silver eels, up to November 9, when I shut water out, the river being low. If there was a fall run of salmon later than September 9, they succeeded in passing Lawrence without being observed. I did observe one salmon in October, in the South Canal, near the gates at the upper end. It was swimming near the surface of the water. I dipped it up and put it in the fishway; it was about 18 inches long, and in good condition.

This has been a remarkable year for high water in the Merrimac; river high about all the season; no low water until the last of October, and there has been no obstruction to the passage of fish.

Mr. B. F. Smith of Andover twice carried alewives from the fishway up to Haggett's Pond so as to get them to spawn there as they used to do. If other persons would adopt the same plan with other ponds that are tributary to the Merrimac, I should think the run of alewives could be largely increased, and the towns in which the ponds are situated would be the gainers.

Very respectfully submitted,

THOMAS S. HOLMES,
In charge of Lawrence Fishway.

SHAD.

An arrangement was made last spring, with Mr. Williams of Raynham, to commence shad hatching on the Taunton river, but the attempt was a failure, from the fact, until then unknown, that the shad in this river spawn earlier than those in the Merrimac. Mr. Williams was practically instructed in the artificial hatching of shad at North Andover. Hatching boxes were sent him, and Mr. Chadwick went to Raynham to assist in the work; but they soon found that the seine brought in only spent shad, and it had to be abandoned for this year.

It will be seen by the report of Messrs. Chadwick and Elliott that shad are rapidly increasing in the Merrimac.

It is desirable to continue the work at North Andover and to commence on the Taunton sufficiently early next year to secure a full supply of spawning fish.

To the Commissioners on Inland Fisheries.

GENTLEMEN:— We submit the following report, showing the full details of the work of hatching shad at North Andover during the season of 1887. The hatchery was opened June 9 and closed July 16.

Number of large shad taken,	765
of small shad taken,	988
of shad returned to river alive,	1,537
of shad given away,	216
of salmon taken,	11
of salmon returned to river alive,	11
of sturgeon taken,	1
of black bass taken,	1
of alewives taken, estimated at,	2,000

Two hundred and sixteen large shad were used for obtaining spawn; the balance of large shad taken, not being in condition to spawn, were immediately returned to the river.

The estimated amount of spawn taken was 1,600,000. The number of shad hatched was supposed to be not far from 1,200,000. July 5, the temperature of the water rose to 80 degrees. On the 7th it reached 82, and remained at that point for three days, as will be seen by the table; this caused a loss of 200,000 spawn. When the temperature of the water reaches 82 degrees, 90 per cent. of the spawn will be found to be dead in 24 hours after being taken from the fish. One hundred and seventy thousand young shad

were delivered to the Fish Commissioners of New Hampshire, and turned into the Merrimac at Manchester and Concord; 50,000 were delivered to E. P. Chase of Swansea; 30,000 were delivered to L. E. Burnham of Essex. The balance, 950,000, were turned into the Merrimac at North Andover. The order for 10,000 for Mr. Foss of Rowley was not filled, owing to a misunderstanding of the time he was to come for them.

Parties ordering young fish should come promptly at the time which they are notified, as the young fish cannot be retained in the hatching boxes 24 hours after hatching without causing many of them to die. The following table will show the number of large shad taken each day, the temperature of the water and air, the time of drawing the seine, the proportion of males to females, also the number of grown shad taken at each sweep:—

	Number of Shad Taken.	Males.	Females.	Temperature of Water at 7 p. m.	Temperature of Air at 7 p. m.	Time of Hauling Seine.	Fish per Sweep.
June						P. M.	
9,	10	5	5	66	60	8,	10
10,	17	6	11	65	61	8,	17
11,	20	12	8	68	70	7, 8,	12, 8
13,	30	17	13	69	60	8, 9,	17, 13
14,	21	11	10	68	65	7, 8,	13, 8
15,	61	42	19	68	67	7, 8, 9,	9, 45, 7
16,	32	18	14	69	70	6, 8, 9,	1, 17, 14
17,	28	20	8	70	68	8, 9,	20, 8
18,	15	8	7	70	70	8, 9,	8, 7
20,	52	32	20	73	68	8, 9,	32, 20
21,	48	30	18	72	66	8, 9,	28, 20
22,	32	18	14	72	69	7, 9,	17, 15
23,	29	20	9	73	70	8,	29
24,	—	—	—	—	—	—	—
25,	—	—	—	—	—	—	—
27,	—	—	—	—	—	—	—
28,	19	11	8	72	70	8,	19
29,	58	30	28	73	76	8, 9,	31, 27
30,	23	21	2	74	72	8, 9,	23, 0
July							
1,	63	37	26	76	76	8, 10,	33, 30
2,	21	15	6	79	78	8,	21
5,	42	30	12	80	70	8, 9,	20, 22
6,	38	25	13	80	75	8, 9,	18, 20
7,	19	13	6	82	72	9,	19
8,	—	—	—	82	—	—	—
9,	—	—	—	81	—	—	—
11,	29	20	9	77	70	8, 9, 10, 11,	9, 8, 10, 2
12,	20	5	15	77	68	8, 9,	12, 8
13,	16	1	15	79	76	9, 10,	9, 7
14,	8	1	7	78	70	8, 9,	6, 2
15,	10	1	9	77	68	8, 9,	6, 4
16,	4	2	2	78	70	8, 10,	3, 1

As was predicted in the report of last year, there was a large increase in the run of fish this season. The size of the shad exceeded that of any previous season; several large ones were found to weigh six pounds each, and one weighed six and a quarter pounds. The salmon taken were of an average of eighteen pounds,—one, very large, thirty-five pounds. The degree of success attending the work of hatching shad on the Merrimac may be judged from the increase of this fish, and the fact that this season the cost to the State has been less than twenty-five cents per thousand. This is certainly a favorable showing, when we take into consideration that in the early period of hatching on the Merrimac the cost to the State was sixty cents per thousand, and in future, under favorable circumstances, the cost should not exceed twenty cents per thousand. This would seem to be quite low when it is known that a grown shad has a ready market value of twenty-five cents as an article of food.

In attempting to restock the Merrimac many obstacles have been met, and in most cases overcome, and the return of so many fish the present season certainly indicates that our labors have not been in vain. Respectfully yours;

B. P. CHADWICK.

ROBT. ELLIOT.

BRADFORD, Sept. 3, 1887.

TROUT.

From the distribution of trout made during the last three years very favorable accounts have been received, showing a large increase over former years. As they are mainly put into public waters, open to any one, it is impossible to obtain more than a general estimate. There have been apparently but few failures, and if the practice of taking fingerlings, or small trout, could be stopped, much better results could be obtained.

As a rule, all applications for trout fry close by the first of April. The number of fish in the hatching-house being known, this gives an opportunity to apportion them to the applicants, and any change, either by more applicants or by the failure of some to come for their fish after a part have been delivered, disarranges the plans for distribution and makes it difficult to readjust. Applications made after April 1, often have to stand over until the next season, and the failure of parties to come for their fish results in leaving

some in the house until the weather is too warm to send them any great distance.

Owing to the fact that there are no ponds connected with the hatchery, and that these remaining fish would have died if left in the troughs, they have, for the last three years, been placed in a stream indirectly under our control, an ordinary one, almost entirely destitute of trout, and as such represents a fair average of the trout streams of the State. These remnants have amounted to from one to five thousand a year. An examination of this stream this fall showed it to be well stocked with trout, some weighing, apparently, a pound.

This experiment, which has thus far been carefully made, will be valuable as testing the practical advantage of stocking streams with trout by artificial propagation.

We received from the works at Plymouth, N. H., about 387,000 trout eggs, which hatched with a small per cent. of loss, and were distributed as follows:—

Chas. N. Foote, Lee.
 Wm. Lawrence, Worcester.
 Wm. L. Nichols, Richmond.
 T. L. Cushman, Springfield.
 A. E. Alden, Stoneham.
 C. A. Howland, Zylonite.
 E. G. Loomis, Bedford.
 J. F. Barker, Springfield.
 A. Pierce, Topsfield.
 E. L. Parker, Pittsfield.
 H. R. Peirson, Pittsfield.
 J. H. Manning, Pittsfield.
 Ira Lawson, Hancock.
 E. C. Hawks, Charlemont.
 A. L. Plympton, Roxbury.
 A. N. Rossiter, Richmond.
 W. H. Little, Sheffield.
 N. F. Mays, Revere.
 J. B. Peck, North Attleborough.
 Eben Sutton, North Andover.
 John F. Sutton, North Andover.
 Jas. F. Butler, Ipswich.
 Joshua N. Foss, Rowley.
 J. A. Blake, Ipswich.
 Wm. B. Smart.
 Geo. E. Farley, Ipswich.

J. O. Parker, Methuen.
 N. P. Jones, Billerica.
 A. L. Dame, Methuen.
 Dr. Saml. Camp, Great Barrington.
 E. S. Merrill, Winchendon.
 C. Warren Cheney, Athol.
 H. H. Patten, Springfield.
 G. M. Whiten, Whitinsville.
 F. D. Foote, Springfield.
 J. A. Murphy, Springfield.
 F. S. Bedell, Wilmington.
 B. C. Cahoon, East Falmouth.
 A. P. Jordan, Ipswich.
 J. T. Holbrook, Palmer.
 N. C. Locke, Salem.
 J. B. Hull, Stockbridge.
 Dr. G. B. Elliott, Lawrence.
 G. H. Herrick, Attleborough.
 Wm. C. Barnes, Southbridge.
 Dan'l Gay, Springfield.
 C. S. Wheeler, Williamsburg.
 W. H. Thayer, Williamsburg.
 P. H. Savage, Cape.
 C. Ticknor, Great Barrington.
 Chas. Squier, Monson.
 S. W. Ingalls, Zylonite.

Historical Society, Worcester.
John A. Loring, Cape.
John Bartlett, Cambridge.
J. Barrett, East Hampton.
Wm. S. Little, East Hampton.
A. A. Mann, East Hampton.

J. A. Loomis, East Hampton.
L. W. Robinson, Ware.
F. A. Burnham, Holliston.
L. D. Bailey, Shelburne Falls.
Wm. Mears, Tewksbury.

LAND-LOCKED SALMON.

The amount of spawn for 1887 was about one-half that obtained in recent years, and a still further reduction will be made for 1888. The town of Falmouth has for the past three years received its share of these fish, and Mr. B. C. Cahoon, chairman of selectmen, in his returns this fall says : —

“ We cleared the stream running into Coneamesset Pond and placed the fry in different parts of the stream and pond. Salmon have been seen quite plenty this year, and several have been caught from the shore weighing from one to one and one-half pounds. No permits have been given, and these salmon have been caught by boys who did not know what they were.”

The distribution this year is as follows : —

Charles Bird, Walpole.
C. A. Howland, Zylonite.
A. L. Dame, Methuen.
B. C. Cahoon, Falmouth,
William C. Barnes, Southbridge.
S. S. White, Wakefield.
P. McCarthy, Lawrence.
E. W. Baker, Fall River.

H. H. Fisk, Dennis.
J. O. Parker, Methuen.
E. S. Merrill, Winchendon.
N. C. Locke, Salem.
J. B. Hall, Stockbridge.
H. E. Priest, Waltham.
C. Curry, Sturbridge.
Thomas H. Lawrence, Falmouth.

SALMON.

From well known facts, obtained through artificial propagation of these fish, it was confidently predicted that there would be an increased run of salmon in the Merrimac during the year 1886.

From some unknown cause this did not take place. Various reasons were assigned for this failure, the most important being a report, from parties who were interested in the stocking of the river, stating that the young fish going to the sea were killed in passing through the turbine wheels at Manchester, Lowell, and especially at Lawrence. So confidently was this asserted, that the Commissioners of the two States,

at their annual meeting, decided not to contract for any further supply of salmon spawn until a thorough investigation of this report was made.

An examination into the construction of the turbine wheel showed that probably not one fish in a thousand would be likely to be destroyed in passing through it. A close watch at several places below the mills did not result in finding any dead or injured fish.

As the young salmon in the Merrimac run to the sea on the spring freshets, it is probable that most of them "tail" over the dams. Very few are seen in the canals leading to the mills.

Following this investigation came the report that an increased run of salmon was passing over the Lawrence fishway. It may be well to repeat that this fishway is drawn off twice a day during the run of migratory fish, sufficiently to determine what fish are passing through it. This occupies about fifteen minutes each time, or one-half hour of the twenty-four. In that time during the past season sixty-nine salmon were seen. This indicates the comparative run of fish, but does not determine the full number passing up the river.

Forty adult salmon were taken at the hatchery at Plymouth, N. H., and kept in the ponds to be stripped of their eggs in the spawning season, and then returned to the water alive. Many more would have been taken had it not been for a heavy rise in the river during the best part of the run, which prevented the use of the net at that time. Those that escaped passed up to their spawning beds at the head-water.

Salmon in the Merrimac spawn in the fall and return to the sea on the spring freshets. As they spawn every other year, the run of this year will not, therefore, return till 1889.

There is no reason to conclude, however, that there will be any decrease next year, as the continuous planting at the head-waters will more than make up for the absence of these fish, while the run for 1889 should be more than double that of this year.

If the run of salmon this year could have been taken from the fishway at Lawrence, and kept in a suitable place

till their spawn was ripe, more than a million young salmon would have been obtained for next spring's planting.

The association with the United States Commission for the procuring of salmon spawn for the different States, which was suspended this year, for reasons above stated, should be continued until the supply in the river is sufficient to enable the Commissioners of the two States to take the necessary amount of spawn.

The river is now open for taking salmon with hook and line, and the indications are that it will soon become an attractive resort for anglers.

To the Commissioners on Inland Fisheries for the Commonwealth of Massachusetts.

GENTLEMEN:—Since my last report to you (Nov. 17, 1886), 500,000 Penobscot salmon eggs have been received at the hatchery from Bucksport, Me.

The young salmon fry were planted in May in the head waters of the Pemigewassett river. The total loss from the time the eggs were received until the fry were planted was less than one per cent. The young parr and smolt were as plenty as usual in the river this season.

It gives me pleasure to report that there has been a larger number of salmon in the river this season than any year since the Lawrence dam was built. Forty salmon were taken in the pounds, from which a large number of eggs will be secured. The number would have been largely increased had not the heavy July rains kept the river very high for two weeks during the heaviest part of the run. The largest fish taken was a female, forty inches in length, weight twenty-four pounds. The smallest, a grilse, weight four and one-half pounds. This was the first grilse taken in the nets since the station was established.

The number of brook-trout eggs taken was 775,000, of which one-half (387,000) were sent to Winchester, care of Mr. E. A. Brackett. There are now 750,000 eggs of the brook-trout in the hatchery, and I think the number will reach over 800,000.

As instructed, I sold 93 pounds of the large male trout for \$32.25, and purchased 1,806 small brook-trout from 4 to 8 inches in length for \$52.40, leaving \$20.15 to be paid by Massachusetts and New Hampshire. There are many more of the large male fish that should be disposed of another spring.

The tile pipe from the main spring broke twice during the winter, causing considerable trouble to find the place and repair it.

I have taken up the tile pipe for a distance of 95 feet in front of the house and replaced it with a two-inch iron pipe. There are many springs in the ground in front of the hatchery where the pipe was laid and the washing away of the soil from under the short pieces allowed them to drop. The iron pipe will obviate this difficulty. All necessary repairs have been made and the station is in good condition.

I would recommend that a barbed wire fence, at least seven feet high, be placed around the trout ponds. This I consider necessary for the safety of the fish.

E. B. HODGE, *Superintendent*.

PLYMOUTH, NOV. 14, 1887.

FISHERIES ON THE MERRIMAC.

After three years of careful and expensive investigation, it was found that the destruction of the shad fisheries of the Merrimac was largely due to the use of small mesh seines at Newburyport.

The young shad on their way to the sea play back and forth, as all migratory fish do, in passing from fresh to salt waters, or from salt to fresh waters, congregating in coves and places out of the current. By the use of small mesh seines these young shad were swept in by the thousands and were used for bait for eel pots and other purposes, and often large quantities were left on the shore to decay.

In 1884 the Legislature, after a long and protracted discussion, passed an Act restricting the use of nets at Newburyport to a mesh not less than two and one-quarter inches.

Although this Act was passed by an overwhelming vote it was, nevertheless, a compromise made by the State with the fishermen, based on the fact that there had been, in years past, and might be again, schools of menhaden entering the river, which were valuable at certain seasons of the year for bait, and that there was still a considerable run of blue-backs that could be used for that purpose. Otherwise there was no reason why the fishermen at Newburyport should have privileges not asked for nor granted to the fishermen above.

Soon after this Act was passed, a consultation was held with the fishermen on the lower part of the river, in which

there was a frank and free discussion of both sides of the question, and the assurance given to the fishermen, that the law was for the public good and that there was no disposition to deprive them of any reasonable amount of fishing. The fishermen expressed themselves satisfied and agreed that if further legislation was to be asked for they would consult with the Commissioners before going to the Legislature.

In violation of this understanding they appeared before the Legislature last winter, asking for a law, which, had it passed, would have led to the complete destruction of all migratory fish in the river.

Perhaps the fishermen are not so much to blame in this matter as those who for selfish reasons mislead them.

Then menhaden have, for years, been driven from the harbor and mouth of the rivers by steamers using purse-nets. The blue-backs have been so scarce that they have become of little or no value. The use of the two and one-quarter inch mesh in the lower part of the river, which was a compromise, to enable the fishermen to take these fish, necessarily destroys a large number of one and two-year old shad which are found there during a greater part of the summer.

There can be no reasonable complaint from the fishermen of the lower Merrimac, nor any that should for a moment command the attention of the Legislature, and if they are not willing to abide by the present law, we recommend that the laws controlling the fisheries at Newburyport be made uniform with those on the upper part of the river.

To the Commissioners on Fish and Game.

GENTLEMEN : — In making my report, I beg leave to say that when the menhaden frequented the lower part of the Merrimac, the fisheries of Newburyport were of considerable value ; but since 1880, these fish have appeared but once, and then in such small numbers as to be of little or no value, so that the fishermen have been obliged to rely on the blue-backs and other small fish found in the river during the summer and fall.

Practically, since the disappearance of the menhaden, the fisheries have been almost a failure, yielding an average of only about three hundred dollars a year. This year the catch of bait, with

the exception of what was taken to bait eel-pots, did not exceed one hundred barrels, worth about \$125.

Regulating the mesh of the nets to not less than two and one-quarter inches was not the cause of this failure, for it did not prevent the taking of blue-backs, and what fish passed through the mesh were too small to be of use.

Fortunately, the fisherman are not dependent on their nets for a living. They are mostly engaged in clamming, and fishing is more a recreation than a source of profit.

Most of them are good hearted, but somewhat excitable men, possessed of enough good sense to know that the laws do not seriously interfere with their fishing, and if let alone by designing politicians there would be no trouble with them.

EDWIN F. HUNT, *Deputy Commissioner.*

NEWBURYPORT, MASS., Dec. 1, 1887.

CARP.

The State pond at Tewksbury has furnished sufficient young carp to supply all applicants during the present year. Those sent out this fall were strong, healthy fish, a year and a half old.

The pond where they were bred is fed by springs, and the parent fish do not spawn as early, nor is the growth of the young carp as rapid, as would have been the case had the water been warmer.

These young fish were sent out in six-quart covered pails, each containing from fifteen to twenty carp and about two quarts of water. Notwithstanding the size of the carp and the fact that some of them were thirty-six hours on the way to their destination, there was loss only in one instance and that only partial.

While there is a great deal of inquiry in regard to carp, but very few persons have constructed proper ponds for them. That they will grow rapidly in this climate has been proved by the experiment at Tewksbury and elsewhere.

If removed from the pond and put into clear cool water for a few days before they are wanted for the table, the flesh becomes hard, free from muddy taste and very palatable.

In no other way, on the farm, can the same amount of food be raised so cheap and with so little care.

Some of the Southern and Western States have gone extensively into the culture of these fish, and there are now in this country thousands of well constructed ponds producing annually large numbers of carp. It is useless to dump them into mud ponds, as some have done; success will come only to those who have well arranged ponds under complete control, so that they can be drawn off or flowed, as necessity may require.

There are hundreds of places in this State, worthless for any other purpose, where a small outlay would ensure the requisite condition for the successful propagation and growth of carp.

So much has been done in this direction that any desirable information in regard to their culture can be obtained, either from the experience we have had with the fish under our care, or from reliable publications.

Some complaints were received from applicants because they did not in all cases receive leather or mirror carp.

Out of sixty breeding fish at Tewksbury, only five were *scale* carp (and these have been removed from the pond), and yet three-quarters of the young fish were scale carp.

The following extract from the United States Commissioners' report, written by Dr. Hessel, who is authority on the subject, will explain this:—

VARIETIES OF GERMAN CARP. — The typical form of the species is what is known as full-scale carp. From this, fish-culturists, availing themselves of the tendency of all animals to break under domestication, and by exercising care in selection, have produced two well-defined varieties, namely, the mirror and the leather carp. In the mirror carp the scales are much larger and more irregular than in the full-scale fish, and portions of the skin are without scale covering. In the extreme form of variation, the leather carp, the scales have entirely disappeared. Between the scale, the mirror, and the leather carp there are an infinite number of intermediate forms, approximating more nearly to one or the other of these distinct varieties. Neither the mirror nor the leather variety can be maintained pure except by careful selection in breeding. It will be found that the progeny of either the mirror or the leather carp will present all the intermediate forms from scale to leather. From each generation it will be necessary to

select those individuals for breeders which represent more nearly the form or variety which it is desired to perpetuate.

DISTINGUISHING THE SEX OF FISH. — Mr. Martin Metcalf, of Battle Creek, Mich., writing on February 13, 1886, says: — The experienced fish manipulator can detect the male fish of almost any family at sight, by reason of its smaller, cleaner, slenderer make, narrower and more pointed muzzle, distance between the eyes, and other inexpressible peculiarities, which when once recognized are almost unmistakable.

The breeding ponds should be drawn off either late in the fall or early in the spring and cleared of frogs, tadpoles and all kinds of insects likely to feed on the spawn and young fish, and if possible all the breeding fish moved to other ponds soon after they have spawned.

All applicants for carp will receive them in the fall, giving them ample time through the summer to prepare the ponds for their reception. They require neither food nor care during the winter if the pond is properly constructed.

The following list shows the distribution of carp: —

Geo. H. Snowdon, Melrose.

Geo. Sibley, Salem.

S. E. Abbott, Salem.

W. N. Graves, Southampton.

C. C. Peck, North Attleborough.

F. M. Whiting, North Attleborough.

A. N. Rassiter, Richmond.

A. L. Dame, Methuen.

C. N. Locke, Salem.

J. D. Richards, North Attleboro'.

C. D. Miner, Colrain.

J. P. Woodworth, Chicopee.

Fred'k R. Shattuck, Cape.

Levi Cluff, Lawrence.

C. W. Swallow, Dunstable.

Chas. Sherwin, Ayer.

J. H. Jenkins, West Barnstable.

Wm. Dotten, Winchester.

Alfred A. Hunting, Gloucester.

LOBSTERS.

Owing to the great extent of sea-coast, and the fact that many lobster-pots are set two and three miles from the shore, there has been considerable difficulty in enforcing the lobster law.

During the past year there have been twenty-nine arrests and twenty-five convictions reported. Three parties were discharged under rulings of judges of inferior courts, which seem open to criticism, inasmuch as they appear to be in direct contradiction of the plain wording of the law, the decisions of other judges under which more than fifty convic-

tions have been made during the past two years, and the rulings of the Supreme Court in the case of the Commonwealth *vs.* William A. Baker, a rescript of which will be found in the Appendix.

We shall continue to rigorously enforce the law so long as it is our duty to do so, and we have the means for that purpose; but at the same time, it is proper for us to state that we have received information from dealers, and the more intelligent among the lobster catchers, showing the inefficiency of the present law in preserving the lobsters, and that a close season during a portion of the time when lobsters are spawning will be necessary, in order to prevent a rapid decline of these crustaceans. The “ten and one-half inch” law does not protect spawning lobsters to any extent, as very few lobsters of the specified length are spawners.

In consequence of the rapid decrease of the lobster in Canadian waters, the Dominion Government has wisely decided to prohibit this fishing for a term of years.

With the added experience of another year, we again renew our recommendation of last year in favor of a close season.

In order that we may be better able to enforce the fish and game laws, we most earnestly request the appointment of an additional officer on the State detective force, who, under the chief, shall be subject to our control. This request is made after a consultation with Mr. Wade, chief of the District Police, for the reason that his present force is not adequate to supply us with any assistance.

It is also desirable that the Commissioners and their deputies should be empowered to make arrest, without warrants, of parties found violating the fish and game laws.

E. A. BRACKETT, *Chairman Board of Inland Fisheries and Game.*

DEAR SIR:—Soon after I received my appointment I visited all the fish markets in Lynn and notified them not to use any more small lobsters in any shape. I sent notice to Nahant for the lobster catchers to throw away the little ones or they would be prosecuted, and also all along the shore from Nahant to Rockport.

On June 18, I went to Nahant and found that the catchers were still saving small lobsters, and made two arrests. On July 9, I went to Salem and Beverly and made three arrests. During this time I visited Lynn and Nahant several times, and on August 9

I made another arrest at Nahant. On August 15, I started on a three weeks' cruise and inspected the coast from Nahant to Essex, and made two arrests at Gloucester and three at Rockport.

A few days after these arrests I watched the lobster catchers along these shores haul their traps, not being observed by them, and found that they were throwing the little ones into the water as soon as they caught them.

LOBSTERS SEIZED.

Nahant, . . .	June 18.	Thomas Pennell.	6 lobsters.
" . . .	" 20.	Fined \$30 and costs.	Paid.
Nahant, . . .	June 18.	Charles E. Gove.	9 lobsters.
" . . .	" 23.	Fined \$45 and costs.	Appealed.
Marblehead, . . .	June 28.	Joseph H. Atkins.	20 lobsters.
" . . .	" 29.	Fined \$100 and costs.	Paid.
" . . .	Nov. 18.	Discharged by Superior Court.	
Marblehead, . . .	June 28.	Benj. F. Stevens.	3 lobsters.
" . . .	" 29.	Fined \$15 and costs.	Paid.
Salem, . . .	July 9.	Arthur A. L. Kinsley.	3 lobsters.
" . . .	" 13.	Fined \$15 and costs.	Paid.
Salem, . . .	July 9.	Thomas F. Hogan.	6 lobsters.
" . . .	" 13.	Fined \$30 and costs.	Paid.
Beverly, . . .	July 9.	John H. Bates.	5 lobsters.
" . . .	" 16.	Discharged.	
Rockport, . . .	Aug. 17.	William Stillman.	20 lobsters.
" . . .	Sept. 2.	Fined \$10 and costs.	Paid.
Rockport, . . .	Aug. 17.	Charles F. Harwood.	3 lobsters.
" . . .	Sept. 2.	Fined \$5 and costs.	Paid.
Gloucester, . . .	Aug. 17.	Nelson Rowe.	17 lobsters.
" . . .	Sept. 2.	Fined \$10 and costs.	Paid.
Gloucester, . . .	Aug. 17.	Edward Witham.	20 lobsters.
" . . .	Sept. 2.	Fined \$10 and costs.	Paid.
Nahant, . . .	Aug. 9.	Charles E. Gove.	13 tails, broken from the body and weighing only 30 oz.
Lynn, . . .	Sept. 13 and 23.	Discharged.	
Whole number of arrests			13
Convicted in the Police Court			11
Discharged			2
Appealed			2
Discharged in the Superior Court			1
Laid over until January term			1

The cases that I failed to convict on whole lobsters were just the same as those that were convicted. The lobster catcher had hauled his traps, there being two men in the dory, and rowed several miles into a harbor and landed one man to get the water ready, in which to boil the large lobsters, while he pushed off to

assort the lobsters and break the tails from the little ones. When I got within about thirty yards he recognized me and started to row away, but I soon overtook him, and found about two hundred lobsters, three quarters of them being less than ten and one-half inches. I took twenty from the top that measured between eight and nine inches, without overhauling the remainder. The reason I could not commit him was because I could not prove his intent to sell or use these little ones. I know whom he supplied, and also that he bought little ones of others, to mutilate, but I could not prove it. The decision was, that as he had not taken them ashore, where they would die, he did not have them in guilty possession.

In the case of mutilated lobsters I found the man in the act of cutting out the tails, and seized all that he had not opened. Of these I took the tails of thirteen and weighed them. These thirteen tails weighed 30 oz., by which I knew by comparison that the lobsters mutilated were not ten and one-half inches in length. I arrested this man, supposing that the burden of proof rested on the defendant. After a reserved decision of ten days, defendant was discharged.

About nine-tenths of the lobster catchers want the lobster protected, as they can see very plainly that they are hurting themselves by catching these small ones, and also by catching lobsters in August and September, when they are almost worthless, or in July, when they are spawning and shedding their shell. The same men that went to the State House last year, and were opposed to a close season, are the ones that make a business of mutilating soft and small lobsters, while people who do a legitimate business, and throw away the little lobsters, cannot catch good lobsters enough to make the business profitable during these months, so they take their traps ashore and go fishing until October or November when the lobsters begin to have a little shell. A close season would be a great protection to the lobster, because it would not only prevent the taking of them while they are spawning and when they "boil to water," but it would help to enforce the ten and one-half inch law, as the people who catch lobsters and mutilate them would have to stop for a time at least. It would be no disadvantage to the lobster catchers, because this is just the season when there are fish of all kinds to catch, and, as I said before, only the men that intend to catch all sizes of lobsters and mutilate the small ones will follow the business all through the summer.

Yours very truly,

W. H. PROCTOR, *Deputy Commissioner.*

Commissioners on Inland Fisheries and Game.

GENTLEMEN : — I have given considerable attention to the enforcement of the lobster law, as will be seen by the following list of arrests and convictions : —

- APRIL. H. M. Perkins, Salem. Short lobsters. Tried in *District Court, Salem. Convicted and fined \$25 and costs. Paid.*
- JULY. H. M. Perkins, Salem. Seed lobsters. Tried in *District Court, Salem. Convicted and fined \$5 and costs. Paid.*
- JULY. I. M. Page, Salem. Short lobsters. Tried in *District Court, Salem. Fined \$25 and costs. Appealed, and held to answer in October term of Supreme (criminal) Court at Lawrence.*
- AUGUST. Benjamin Huntoon, Beverly. Short lobsters. Tried in *District Court, Salem. Convicted and fined \$50 and costs. Paid.*
- AUGUST. Chase & Colby, Haverhill. Short lobsters. Tried in *District Court, Haverhill. Convicted and fined \$10 and costs. Paid.*
- AUGUST. M. J. Hickey, Haverhill. Short lobsters. Tried in *District Court, Haverhill. Convicted and fined \$5 and costs. Paid.*
- SEPTEMBER. Charles Reynolds, Salisbury. Short lobsters. Tried in *Police Court, Newburyport. Failed to convict.*

Charles Reynolds and his assistants were then arraigned, charged with obstructing an officer of the commission in the discharge of his duties. This case also failed of conviction.

One of these arrests was for having young lobsters' tails in possession, and one for seed bearing lobsters in July, when prohibited by law.

So far as I have been able to learn there is a general desire for a close season. Yours respectfully,

EDWIN F. HUNT, *Deputy Commissioner.*

NEWBURYPORT, MASS., Oct. 1, 1887.

To the Commissioners on Inland Fisheries.

GENTLEMEN : — As one of the several deputy Fish Commissioners of the State, I received your instructions for a more rigid enforcement of the law regulating the sale of lobsters. I immediately gave my attention to the subject, and submit the following report : — Since August 1, I have made seventeen seizures of short lobsters, have had nine persons arrested and brought before the courts, eight of whom were convicted and paid fines and costs of prosecution, in all amounting to \$172.40. There have been no appeal cases. I have searched five seaside hotels, in two of which I found short lobsters. Have examined, and in some instances searched, seventy-six fish markets ; found short lobsters in two of them. This would indicate that the proprietors of our

fish markets do not desire to sell short lobsters, and many of them remarked that they were glad the law was being enforced, as it would give them lobsters of a more salable size. In the case where I seized a barrel of short lobsters at the Boston & Lowell station in Lawrence, the agent of the company said there was no desire on the part of the company to transport short lobsters, and if I would not take them away, he would immediately reship them to Maine, and notify the parties sending them that no more lobsters of that character would be received at the station of the company. I accepted his proposal, and the lobsters were returned to Maine. The expressmen are often reluctant to take packages of lobsters on their carts, fearing they may not be of legal length. I cannot find any one who has any desire to have anything to do with short lobsters, except those who catch them, and the only excuse that they give for not complying with the law, is the trouble and inconvenience they are subjected to in measuring them. That the law is generally regarded as a good one may be judged from the fact that persons, after being brought before the court, pleading guilty and paying a fine, have pleasantly said it was right to enforce the law, and further than that, have assisted me in bringing other offenders to justice. In the discharge of my duty I have been allowed the largest liberty possible, no one questioning my right to search, not even asking me to show my commission, except in one instance. This was where I found a colored man selling short lobsters from a cart on the street. As I proceeded to place a ten and one-half inch mark upon his cart, and informed him that he must not sell, offer for sale, or have on his cart a lobster less than ten and one-half inches in length, he promptly asked for my authority. I showed him my commission, but he could not read it, and asked me to do so. I then read it to him, also that portion of the law that refers to the possession of short lobsters. He then modestly asked if Cleveland made that foolish law. As I took six short lobsters from his cart, and proceeded to walk away, he called after me, "Ain't you going to pay for dem lobsters? A white man wouldn't do dat in Virginia." The colored man, however, paid his fine of twenty dollars and retired from the short lobster business. At Nahant I found it was the practice of some lobster catchers, when sorting their lobsters, to retain those that were from eight to ten inches in length, break off the tails and throw the body back into the water to die a lingering death. This method is not only wasteful, but extremely cruel, and how a man who expects to obtain a living by catching lobsters could consent to destroy twelve half-grown lobsters for the sum of thirty cents is more than I can account for, except

upon the ground that he desires to extend the idea of total depravity.

An industry furnishing a food supply of the value of \$400,000 would certainly seem to be worth preserving. As a means of protecting and enlarging this industry, the law regulating the sale of lobsters was enacted. There has not been a decided attempt to enforce the law in this vicinity until the present season. Still, there was a marked increase in the size of the lobsters offered for sale in our markets immediately upon the passage of the law. The recent law authorizing the deputy commissioners to search and seize, put the short-lobster dealers in close quarters. It should, however, have been accompanied with authority to arrest. A person with authority to search and seize would seem to be the proper person to make the arrest, and not be obliged, after making a seizure, to often travel miles to find an officer qualified to arrest. This additional authority, with a close season from the first day of August to the 15th of September, I would earnestly recommend for the following reasons:—Many dealers do not care to handle lobsters in August, and I have yet to find a dealer who objects to a short close season. The catchers frequently meet with severe loss, owing to the perishable nature of the lobster in the extreme heat of summer; and there are hundreds of small pleasure parties who visit the seashore in August, and daily engage in catching lobsters, not for sale, but for immediate use. Thousands are thus taken, more than eighty per cent. of which are less than ten inches in length. A close season would prove an effectual remedy for this evil; and further, when the lobster is shedding its shell its meat becomes soft, and when boiled there is a large shrinkage, and as an article of food it becomes comparatively worthless. The lobster is admitted to be of slow growth until it reaches a length of nine and one-half inches. Its growth during the next year is said to add to its length nearly one and three-fourths inches, and its increase in weight is seventy per cent. When lobsters are plenty, those nine and one-half inches in length have a wholesale market value of \$4 per hundred; those eleven and one-fourth inches in length, a value of \$7 per hundred. If this statement is reliable, and I have evidence that it is, this fact alone would seem to be sufficient to induce any person catching lobsters for a living not to retain a lobster that was only nine and one-half inches in length, unless he had fully resolved to destroy his business by robbing himself.

The practice of the catchers in retaining short lobsters for the purpose of using them for bait is ruinous to the industry, and should be immediately abandoned. Should the catchers persist in

this wasteful method of obtaining bait for their traps, the deputy commissioner should be authorized to immediately destroy all traps he may find set and baited with short lobsters. Lobster traps, if possible, should be so constructed as not to retain the small ones. When large quantities of lobsters are taken, they are frequently crowded into a small floating car, without food, there to await a market. They may be sold the next day, or in five days. The lobsters continue to struggle for their liberty, and when taken from the car, some are dead, — others are found in a crushed, mangled, torn and dying condition. Their struggles for an existence are then finished by being plunged into a kettle of boiling water. The amount of humane treatment that a lobster receives by such a method of handling is certainly small. When those who catch lobsters comply with the law, there will be little, if any, necessity of looking after others.

Respectfully yours,

B. P. CHADWICK, *Deputy Commissioner.*

BRADFORD, NOV. 15, 1887.

RETURNS OF WEIRS, SEINES AND GILL-NETS.

The returns from fishermen have continued to decrease in number, and there are twelve less this year than for 1886, notwithstanding that special efforts were made to secure full returns, and over a hundred more blanks were sent out than last year. It has been the hope of the commissioners that the fishermen would realize the great importance of the statistics it is sought to collect, as from accurate statistics of the condition of the fisheries proper legislation can be brought about for the lasting benefit of all engaged in the business, and for the maintenance of the great source of food supply to the people of the State.

As will be seen by comparing the returns for past years, there are many men engaged in the honorable occupation who have made returns from year to year, not only complying with the law willingly but taking an interest in the returns. As a rule the larger and best conducted of the fisheries are those where the greatest interest is taken in the work of the commissioners. There are, however, many fishermen who have small pounds and weirs along the coast, or who, more or less regularly, fish with gill-nets or seines, who have not made returns. Some of these men are so

ignorant as to think that the returns in some way were to be used as a means of assessing taxes by the State, while others have considered that the demand for returns was an imposition upon their natural rights.

It is evident that kindly efforts on the part of the commissioners have brought forward all those by whom such efforts are appreciated, and that it will now be necessary to use the strong arm of the law if these valuable statistics, necessary for the welfare of the State and of the fishermen alike, are to be obtained in full.

In another place in this report we have asked for the appointment of an additional officer on the State detective force, that the chief may be able to give the commissioners the aid they must have in order to enforce the laws. With such an officer to explain the law to the ignorant and secure the arrest of those who disobey it, there is no doubt but that full returns would hereafter be made of the fisheries coming under the provisions of the special law, which without the aid of such an officer it is impossible to enforce.

The returns from pounds and weirs are 4 more than for last year; from sea-seines 4 less; from gill-nets 10 less.

The single return from the Merrimac, at North Andover, gives a catch of 28 Shad from May 18th to the 31st, but this is no criterion of the run in the river, as is shown by the number taken at the State hatchery at the same place from June 9 to July 16, during which time 1,753 shad were taken and 1,537 were returned alive to the river after taking over $1\frac{1}{2}$ million of eggs from the fish caught. The fish caught at the State hatchery have not been included in the returns of past years and therefore should not be counted in now, and the number of shad taken there is only alluded to here to show that this fish, as well as the salmon, is again established in the river, where both can be maintained if over fishing is prevented and the young are protected.

The single return of 850 Shad from the Connecticut River shows an increased catch of 273 over last year in that river, owing to the high stage of water through the season, which enabled the fish to pass the obstructions below and reach their natural spawning grounds in this State.

From Taunton River the same number of returns have

been made this year as last. The number of Shad taken in this river has increased over last year, and is about the same as for the years 1884 and 1885.

From the other fresh water fisheries there are two less returns this year than last and not a Shad is reported.

The total catch of Shad (exclusive of the 1,753 taken at the hatching-house on the Merrimac, and nearly all returned to the river alive) gives an increase of 807 over that of last year.

The decrease in the number of Alewives, as shown by the returns, is about 65,000, notwithstanding special reports which indicate that this fish was far more abundant in many places than last year, and our own observations are conclusive that the free access which this fish has had to many of its old spawning grounds of late years is beginning to make a favorable showing, though of course a variation in numbers must be expected from year to year.

The catch of Sea-herring shows an increase of over 972,000. Of Menhaden the increase is about 79,000, nearly three times as many having been caught this year as last. Scup shows an increase of 174,000, and Squeteague of nearly 15,000. Spanish mackerel has never been an abundant fish along our coast, and only 112 are reported this year, but this is 83 more than last year, and about the same as in 1884. Atkins, Hughes & Co. report that the two Spanish mackerel caught at Truro are the first ever caught in weirs at that place. Bluefish show an increase of about 11,000, and Tautog of 40,000, and the latter are said to have run of large size. Flat-fish have increased nearly 40,000.

Of the several kinds of fish included in the column of "other edible fish" in the returns there has been an increase of over 226,000. Included under this head are Butter-fish, of which there was a large catch. Over 51,000 Sea-bass are included in the returns of weirs at Fairhaven and Goswold, and Messrs. Hiller & Gamons of Fairhaven report the taking of 7 Bonito and 416 King-fish. Messrs. Weeks & Bearse also report King-fish from Harwich. The returns of Atkins, Hughes & Co., for the Weir Company at Truro, contain "700,000 pounds of Pollock caught in May and June."

The only fish of which the returns show a decrease this

season are Striped-bass, about one-half of last year, or a decrease of 2,100; and Mackerel, which have decreased 149,000, the total catch being 1,247,010. There has been a falling off of over 9,000 in the catch of Eels.

The return from the pounds of C. H. Pease & Co. of Fairhaven, which do not report any catch after August 2d, has the following note:—

“Tautog, Flat-fish and Alewives have been so plenty this spring that we had to return hundreds of them back to the sea for want of a market. Tautog have been extra plenty and very large, more so than we ever knew them. Rock-bass and King-fish have had a very large run. At this date we are taking very large Mackerel, about 500 per day, some as large as $2\frac{1}{2}$ pounds.”

For further details of the 112 returns* for this year we refer to the tables in the Appendix, and for a comparison of the catch with previous years attention is invited to the last table in this report.

The returns from leased ponds have in some instances shown an improvement over preceding years. It will be seen by the list in the Appendix that a number of these leases expire next year.

But little interest has been manifested by the lessees of many of these ponds, and, practically, they are open to the public, while others have been so successfully managed and such good results obtained that there will undoubtedly be a strong effort made to retain control over them.

The Commission has from the beginning been successful in maintaining and increasing the alewife fisheries. In addition to their importance as an easy and cheap production of food they are of great value to the fisheries for bait at seasons when nothing else is to be had.

The results obtained in this direction have been sufficient to compensate for all the expenses of the Commission.

* Since this report was put in type returns have come in from the Pound and Gill-net fisheries of D. C. Potter of Fairhaven, as follows:—Shad 1, Alewives 7,474, Striped Bass 1, Scup 9,214, Squeteague 270, Bluefish 274, Tautog 476, Flat-fish 1,997, Eels 515, other fish 1,121. These numbers should be added to the totals in the last table.

BIRDS AND GAME.

The law for the preservation and protection of singing and insectivorous birds is thus soon producing gratifying and palpable results.

These birds are largely upon the increase, to the great benefit of the agriculturist, and comfort and delight of all the people who desire to see our woods and fields populous with birds.

The investment of the Commission with the authority to issue permits for the killing of these birds has resulted in the restriction of the permits to a minimum, only fourteen (14) having been issued in the Commonwealth the present year, and those only to people entirely trustworthy and who do not abuse the privilege. If the farmer, whom the living birds benefit, and the women of the State will co-operate with us,—the one in observing and protecting the birds, and the other in refraining from making bird plumage an article of ornament and apparel,—our birds will in a few years appear in their old time numbers and usefulness.

The English sparrow is a nuisance. It is a destroyer of the young and the eggs of our native birds, and a grain eater more than an insect destroyer. Until it is banished our native birds will be driven from many of their haunts. We recommend the killing of this bird at all seasons. It is good for the table and for that alone.

The matter of the preservation of game birds and animals, the times, seasons and methods of killing, has become in a degree an embarrassing question for the Legislature. The necessity for positive and effective protection is not fully appreciated by the majority of the people. The notion that the right to kill at all seasons and places is inherent in each individual because of our democratic institutions, and under the claim that this is a free country, is altogether too prevalent.

With this assumption runs another equally untenable, that the game and the fish belong to the owner of the land upon which either game or fish chance to be.

The preservation of our game involves two considerations,

the healthful recreation of its pursuit by many of our people and its value as an article of food and merchandise.

So few people, comparatively, — by reason of indifference and of imperfect knowledge of our game resources and its great importance to a large class of people, — understand this subject, that an intelligent and dispassionate hearing by a Legislature is very difficult to obtain.

Excellent, well-meaning men will perhaps thoughtlessly pass the subject of game and fish protection by as a matter unworthy serious consideration, when matters of much less practical but more familiar import receive proper attention.

When it is considered that large portions of the land of the Commonwealth and of all New England are being relegated to renewed forests, abandoned by the farmer for obvious reasons, it should be remembered that these lands may be made populous and productive with hundreds of thousands of the best game birds in the world, the ruffed grouse, the woodcock and the quail, by a proper and symmetrical system of protective law, and with little or no expense to the Commonwealth.

The game birds of New England, even with our rigorous climate, will survive and populate our covers in spite of our dense population; will flourish and increase even in the contest with improved fire-arms, and the multiplying army of men who seek at proper times the fields and woods for health and recreation; will thrive against all climatic contingencies and all appliances, except the insidious and silent snare and trap.

The American people are wasteful of wild life. The buffalo, antelope and elk of the great Western plains and mountains are nearly exterminated by a remorseless hunt for hides, and by wanton sport; so great has been the decrease of these great herds of noble game that national attention has been arrested by the facts, and now Congress has established by law a great territorial asylum of refuge and protection for the remnants of the once great droves and herds of the finest and best game of the world. Even the enormous productiveness of the sea is already so impaired by the depredations of man in search of the food fishes that artificial means

of propagation are resorted to to make good the alarming deficiency.

The horned and hoofed game is nearly gone from Massachusetts. A few wild-eyed and apprehensive deer haunt the pine woods of the Cape, but are barred from roaming beyond their little limit by an enclosing wall of populous towns and villages.

The Commonwealth has thrown about these few remaining cervidæ the protection of its statute. Why? Because it is desirable and wise that there should be saved from slaughter these few remaining individuals of a once prolific family.

Why not now protect the game birds whose habitat is broader than that of the deer, whose numbers may be made to multiply simply by the moral and legal power of a protecting statute, until the by-places of the Commonwealth shall be made preserves of pleasure and profit to many of our people?

It is desirable that the landowner should be interested in this laudable direction. There is no reason why a person not a landowner, yet desiring the advantages of the pursuit of game, should be at issue with the landholder. Their interests are the same. It is natural that the landholder should desire the original use and pursuit of the game upon his land, and that he should protect himself and his property from the depredations of irresponsible persons who would devastate his land of the game to make merchandise of it without his consent.

Let the landholder and the true sportsman consult and act together, first for the preservation of the game, then there will naturally follow mutual methods for its protection. There is no natural antagonism between the farmer, or the landholder, and the decent man who desires to hunt for game in a legitimate and proper way.

Mischievous persons have for years, with more or less success, sought to imbue the landholders with the idea that all efforts within and without the Legislature to save the game by the abolition of snares and traps, and by the imposition of close seasons, are trespasses upon their exclusive and original rights,—that the city sportsman desires to rob the farmer and the farmer's boy for his own selfish emolument and pleasure.

This is untrue. The man who desires a close season for breeding and growing game is analogous to the farmer who would refrain from butchering his cow heavy with calf, or his mother hen while brooding her chicks. He is in line and in sympathy with nature and natural laws. Nature maintains her close time by depriving the fawn and the feathered ground game of scent in their breeding season; she protects the hare crouching in her fragile form in the same way. We must follow nature in this line if we would preserve her bounty.

It is true that the snare and the trap bring more game to market and with less effort than does legitimate and manly pursuit. Like usurious interest, the snare and the trap work night and day, constantly and industriously eating away the principle, destroying the stock.

If our game is to be treated purely as a matter of present commodity without thought for the future or care for the preservation of a natural product that once exhausted cannot be restored, then let the snaring and trapping of game go on.

Ground game once exhausted cannot be replaced by artificial propagation as the fishes can. Its breeding is slow and in small numbers. The only hope is in present preservation.

To the man who clamors for the right to snare and trap on his own land, the reply is that the prevention thereof is for the good of the whole. The holder of the land does not *own* the game, but he has the right while it remains on his land to its first pursuit, or to permit or debar the public from its pursuit if he desires. He should be content with this.

Sunday shooting and fishing, in the country especially, is an annoyance to the farmer and landholder whose lands are trespassed upon, and to all law-abiding people. If the local official would properly enforce the Sunday law in this particular much undeserved censure upon citizens who desire and do hunt and fish at proper times would be removed, as well as much criticism of the restrictive game and fish laws.

Nearly every State and territory is awake to the necessity of the proper protection of its game and fish. Many of them have established statutes forbidding the transportation

of killed game beyond their own jurisdiction, statutes known as non-exportation laws.

Massachusetts lags. First in intelligence and quick in the recognition and adoption of methods of advancement in all desirable things, the old Commonwealth is the least efficient of all the States in this matter we have discussed.

We believe the Legislature has only to learn the facts, and appreciate even in a degree what we urge, when it will devise a symmetrical and effective law for the protection of our game.

E. A. BRACKETT,
F. W. PUTNAM,
E. H. LATHROP,

Commissioners on Inland Fisheries and Game.

EXPENDITURES OF COMMISSION.

Services,	\$1,790 00	
Travelling and other expenses,	251 17	
		<hr/> \$2,041 17

GENERAL EXPENDITURES.

Subscription to Schoodic salmon-breeding station, .	\$300 00	
W. H. Mears, services,	230 00	
A. M. Doane, services,	100 00	
J. A. Burgess, services,	8 00	
" expenses,	7 00	
W. H. Proctor, services,	56 80	
" expenses,	45 57	
Labor,	116 00	
Electrical supplies,	42 42	
Expressage,	36 65	
Bread (carp food),	35 00	
Rent of land for hatching-house,	50 00	
" of pond,	20 00	
Legal services,	23 10	
Printing,	17 22	
Postage,	13 25	
Pails,	13 00	
Lumber,	5 20	
Bread (carp food),	3 40	
Dip net,	2 00	
		<hr/> 1,124 61

Joint Hatching at Livermore Falls.

E. B. Hodge, Superintendent,	\$375 00	
Assistant,	134 00	
Fish meat,	37 30	
Rent of grounds,	25 00	
Expressage,	11 15	
Trout,	10 02	
Planting salmon,	7 50	
Lumber,	4 76	
Teaming,	3 00	
Insurance,	2 50	
Telegrams,	75	
		<hr/> 610 98

North Andover Shad-Hatching Establishment.

Rent of grounds, boats, and seine,	\$50 00	
B. P. Chadwick, { services,	158 00	
{ expenses,	83 48	
E. F. Hunt, { services,	262 00	
{ expenses,	57 70	
Labor,	170 00	
		<hr/> 781 18

\$4,557 94

APPENDIX.

[A.]

LIST OF FISH COMMISSIONERS.

[The following list is taken from "Forest and Stream." Those marked with a * have not been heard from, and the names thus given are those of last year].

THE UNITED STATES.

Prof. G. Brown Goode, Commissioner, .	Washington, D. C.
Dr. J. H. Kidder, Assistant Commissioner,	Washington, D. C.
Col. M. McDonald, Chief of Division of Distribution,	Washington, D. C.

ALABAMA.

Col. D. R. Hundley,	Madison.
Hon. Charles S. G. Doster,	Prattville.

ARIZONA.

J. J. Gosper,	P. O. address, Los Angeles, Cal.
Richard Rule,	Yuma.
J. H. Taggart, Business Manager,	Yuma.

ARKANSAS.

H. H. Rottaken, President,	Little Rock.
J. W. Calloway,	Little Rock.
W. B. Worthen,	Little Rock.

CALIFORNIA.

Joseph Routier, President,	Sacramento.
Thos. J. Sherwood, Secretary,	Marysville.
J. Downie Harvey,	Los Angeles.

DOMINION OF CANADA.

John Tilton, Deputy Minister of Fisheries,	Ottawa, Ont.
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PROVINCE OF NEW BRUNSWICK.

W. H. Venning, Inspector of Fisheries, .	St. John.
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PROVINCE OF NOVA SCOTIA.

W. H. Rogers, Inspector, Amherst.
 A. C. Bertram, Assistant Inspector, . . North Sydney.

PROVINCE OF PRINCE EDWARD ISLAND.

J. H. Duvar, Inspector, Alberton.

PROVINCE OF QUEBEC.

W. Wakeham, Inspector Lower St. Lawrence
 and Gulf Division, Gaspé Basin.

PROVINCE OF BRITISH COLUMBIA.

Thos. Mowat, Inspector, New Westminster.

PROVINCE OF MANITOBA AND NORTH WEST TERRITORIES.

Alex. McQueen, Inspector, Winnipeg, Man.
 S. Wilmot, Supt. of Fishculture, New Castle, Ont.

* COLORADO.

John Pierce, Denver.

CONNECTICUT.

Wm. M. Hudson, Hartford.
 Robert G. Pike, Middletown.
 Jas. A. Bill, Lyme.

DELAWARE.

Elwood R. Norny, Odessa.
 Dr. E. G. Shortlidge, Assistant and Super-
 intendent of Hatcheries, Wilmington.

GEORGIA.

Hon. J. T. Henderson, Commissioner of
 Agriculture, Atlanta.
 Dr. H. H. Cary, Supt. of Fisheries, . . LaGrange.
 Under the laws of the State these constitute the Board of Fish
 Commissioners.

ILLINOIS.

N. K. Fairbank, President, Chicago.
 S. P. Bartlett, Secretary, Quincy.
 Maj. G. Breuning, Centralia.

INDIANA.

Enos B. Reed, Indianapolis.

IOWA.

E. D. Carlton, Spirit Lake.

KANSAS.

S. Fee, Wamego, Pottawatomie Co.

* KENTUCKY.

Wm. Griffith, President, Louisville.
 P. H. Darby, Princeton.
 John B. Walker, Madisonville.
 Hon. C. J. Walton, Munfordville.
 Hon. John A. Steele, Midway.
 W. C. Price, Danville.
 Hon. J. M. Chambers, Independence.
 A. H. Goble, Catlettsburg.
 J. H. Mallory, Bowling Green.

MAINE.

E. M. Stilwell, Bangor.
 Henry O. Stanley, Dixfield.
 B. W. Counce, Sea and Shore Fisheries, Thomaston.

MARYLAND.

Dr. E. W. Humphreys, Salisbury.
 G. W. Delawder, Oakland.

MASSACHUSETTS.

E. A. Brackett, Winchester.
 F. W. Putnam, Cambridge.
 E. H. Lathrop, Springfield.

MICHIGAN.

John H. Bissell, President, Detroit.
 Herschel Whitaker, Detroit.
 Dr. J. C. Parker, Grand Rapids.
 A. J. Kellogg, Secretary, Detroit.
 Walter D. Marks, Superintendent, Paris.

MINNESOTA.

1st District — William Bird, Fairmount.
 2d District — Niles Carpenter, Rushford.
 3d District — Dr. Rob't Ormsby Sweeny,
 President, St. Paul.
 S. S. Watkins, Superintendent, Willow Brook, St. Paul.

MISSOURI.

H. M. Garlichs, Chairman,	. . .	St. Joseph.
J. L. Smith,	. . . . .	Jefferson City.
H. C. West,	. . . . .	St. Louis.
A. P. Campbell, Secretary,	. . .	St. Joseph.
Philip Kopplin, Jr., Superintendent,	. . .	St. Louis.
Elias Cottrill, Superintendent,	. . .	St. Joseph.

NEBRASKA.

William L. May,	. . . . .	Fremont.
Dr. Robert R. Livingston,	. . .	Plattsmouth.
B. E. B. Kennedy,	Omaha.
M. E. O'Brien, Superintendent,	. . .	South Bend.

NEVADA.

W. M. Cary,	Carson City.
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NEW HAMPSHIRE.

Geo. W. Riddle,	Manchester.
Elliot B. Hodge,	Plymouth.
John H. Kimball,	Marlborough.
E. B. Hodge, Superintendent,	. . .	Plymouth.

* NEW JERSEY.

Richard S. Jenkins,	. . . . .	Camden.
William Wright,	. . . . .	Newark.
F. M. Ward,	. . . . .	Newton.

NEW YORK.

Hon. R. B. Roosevelt, President,	. . .	New York.
Gen. R. U. Sherman,	. . .	New Hartford.
E. G. Blackford,	. . . . .	Fulton Market, N. Y.
Wm. H. Bowman,	. . . . .	Rochester.
A. S. Joline,	. . . . .	Tottenville.
E. G. Blackford, Shellfish Commissioner,	. . .	New York.
Seth Green, Superintendent,	. . .	Rochester.
Fred Mather, Superintendent,	. . .	Cold Spring Harbor.
Monroe A. Green, Superintendent,	. . .	Mumford.
James A. Marks, Superintendent,	. . .	Bloomington.
H. H. Thompson, Secretary,	. . .	Brooklyn.
E. P. Doyle, Clerk of Shellfish Commission,	. . .	Tompkinsville.

OHIO.

Hon. C. V. Osborn, President,	.	.	Dayton,
John Hofer,	.	.	Bellaire.
H. P. Ingalls,	.	.	Huntsville.
A. C. Williams, Secretary,	.	.	Chagrin Falls.
E. D. Potter,	.	.	Toledo.

PENNSYLVANIA.

Henry C. Ford, President,	.	.	524 Walnut St., Phil.
James V. Long,	.	.	205 Ridge Ave., Allegheny City.
H. C. Demuth, Secretary,	.	.	Lancaster.
S. B. Stillwell,	.	.	Scranton.
A. S. Dickson,	.	.	Meadville.
W. L. Powell,	.	.	Harrisburg.

RHODE ISLAND.

John H. Barden,	.	.	Rockland.
Wm. P. Morton,	.	.	Providence.
Henry T. Root,	.	.	Providence.

These Commissioners are appointed for three years by the Governor, and receive no compensation except actual expenses.

The following are the Shellfish Commissioners (who are elected by the Legislature and receive pay for their services):—

James C. Collins,	.	.	North Providence.
N. P. S. Thomas,	.	.	North Kingstown.
James M. Wright,	.	.	Foster.

SOUTH CAROLINA.

Hon. A. P. Butler,	.	.	Columbia.
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* TENNESSEE.

W. W. McDowell,	.	.	Memphis.
H. H. Sneed,	.	.	Chattanooga.
Edward D. Hicks,	.	.	Nashville.

VERMONT.

Hon. Herbert Brainerd,	.	.	St. Albans.
F. H. Atherton,	.	.	Waterbury.

VIRGINIA.

Col. Marshall McDonald,	.	.	Berryville.
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* WASHINGTON TERRITORY.

Albert T. Stream,	.	.	North Cove, Pacific Co.
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WEST VIRGINIA.

C. S. White, President,	Romney.
F. J. Baxter, Treasurer,	Sutton.
James H. Miller, Secretary,	Hinton.

WISCONSIN.

The Governor, <i>ex-officio</i> .		
Philo Dunning, President,	. . . .	Madison.
C. L. Valentine, Secretary and Treasurer,		Janesville.
Mark Douglas,	. . . .	Melrose.
A. V. H. Carpenter,	. . . .	Milwaukee.
Calvert Spensley,	. . . .	Mineral Point.
E. S. Miner,	. . . .	Sturgeon Bay.
James Nevin, Superintendent,	. . . .	Madison.

WYOMING TERRITORY.

Otto Gramm,	. . . . .	Laramie.
Dr. W. N. Hunt, Cheyenne, is Commissioner for Laramie County,		
and B. F. Northington, Rawlins, is Commissioner for Carbon County.		

[B.]

LIST OF PONDS LEASED

*By the Commissioners on Inland Fisheries, under Authority given by Chap. 384, Sect. 9, of the Acts of 1869.**

[Those marked by a * have made the required returns.]

1870.

- Feb. 1. *Waushakum Pond, in Framingham, to Sturtevant and others, 20 years.
 April 1. Mendon Pond, in Mendon, to Leonard T. Wilson and another, 20 years.
 Sept. 12. Baptist Lake, in Newton, to J. F. C. Hyde and others, 20 years.

1871.

- April 17. Long Pond, in Falmouth, to Joshua S. Bowerman and three others, 20 years.
 May 15. Pratt's Pond, in Upton, to D. W. Batcheller, 20 years.
 Nov. 1. Punkapoag Pond, in Randolph and Canton, to Henry L. Pierce, 20 years.

1872.

- Jan. 1. *Sandy Pond, Forest Lake, or Flint's Pond, in Lincoln, to James L. Chapin and others, 20 years.

1873.

- May 1. *Meeting-house Pond, in Westminster, to inhabitants of Westminster, 15 years.
 1. Great Pond, in Weymouth, to James L. Bates and others, 15 years.
 July 1. *Little Sandy Pond, in Pembroke, to A. C. Brigham and others, 16 years.

* We would remind lessees of ponds that they are required, by their leases, to use all reasonable efforts to stock their ponds, and keep accurate records of the same, and make returns of their doings to the Commissioners on the *1st of October*, each year, of the number and species of fish which they have put in or removed from their ponds. Any failure to comply with these conditions is a breach of contract invalidating their lease. It is important that the State should know just what is being done; and, where there appears to be mismanagement or apparent failure, the Commissioners will visit the ponds, and ascertain, if possible, the cause.

1873.

- Sept. 1. Pontoosuc Lake, in Pittsfield and Lanesborough, to E. H. Kellogg and others, 15 years.
- Oct. 1. *Farm Pond, in Sherborn, to inhabitants of Sherborn, 15 years.
1. *Spot Pond, in Stoneham, to inhabitants of Stoneham, 15 years.
- Dec. 1. *Lake Wauban, in Needham, to Hollis Hunnewell, 20 years.

1874.

- March 1. Walden and White ponds, in Concord, to inhabitants of Concord, 15 years.
2. *Upper Naumkeag Pond, in Ashburnham, to inhabitants of Ashburnham, 20 years.
- April 1. *Elder's Pond, in Lakeville, to inhabitants of Lakeville, 15 years.
20. North and South Podunk ponds, in Brookfield, to inhabitants of Brookfield, 15 years.
- May 1. Maquan pond, in Hanson, to the inhabitants of Hanson, 15 years.
20. Unchechewalom and Massapog ponds, to the inhabitants of Lunenburg, 20 years.
- July 1. Hardy's Pond, in Waltham, to H. E. Priest and others, 15 years.
1. Hockomocko Pond, in Westborough, to L. N. Fairbanks and others, 15 years.
11. Mitchell's Pond, in Boxford, to R. M. Cross and others, 15 years.
11. Hazard's Pond, in Russell, to N. D. Parks and others, 20 years.
- Oct. 1. East Waushacum Pond, in Sterling, to inhabitants of Sterling, 20 years.
20. *Middleton Pond, in Middleton, to inhabitants of Middleton, 15 years.

1875.

- Jan. 1. White and Goose ponds, in Chatham, to George W. Davis, 15 years.
- March 1. Hood's Pond, in Ipswich and Topsfield, to inhabitants of Topsfield, 15 years.
- April 1. Chauncey Pond, in Westborough, to inhabitants of Westborough, 15 years.
3. West's Pond, in Bolton, to J. D. Hurlburt and others, 15 years.
15. Gates Pond, in Berlin, to E. H. Hartshorn and others, 15 years.

1875.

- April 24. Pleasant Pond, in Wenham, to inhabitants of Wenham, 15 years.
- May 1. *Morse's Pond, in Needham, to Edmund M. Wood, 15 years.
1. *Chilmark Pond, in Chilmark, to J. Nickerson and others, agents, 20 years.
- July 1. Winter Pond and Wedge Pond, in Winchester, to inhabitants of Winchester, 15 years.
1. *Haggett's Pond, in Andover, to inhabitants of Andover, 20 years.
- Aug. 1. *Oyster Pond, in Edgartown, to J. H. Smith and others, 20 years.
9. *Mystic (Upper) Pond, in Winchester, Medford and Arlington, to inhabitants of Winchester and Medford, 15 years.
- Oct. 1. Little Chauncy and Solomon ponds, in Northborough, to inhabitants of Northborough, 15 years.

1876.

- Feb. 1. Great Sandy Bottom Pond, in Pembroke, to inhabitants of Pembroke, 15 years.
- March 1. Dennis Pond, in Yarmouth, to inhabitants of Yarmouth, 15 years.
- March 1. *Crystal Lake, in Wakefield, to Lyman H. Tasker and others, 15 years.
20. *Lower Naumkeag Pond, in Ashburnham, to inhabitants of Ashburnham, 18 years.
28. *Dennison Lake, in Winchendon, to inhabitants of Winchendon, 15 years.
28. Phillipston Pond, in Phillipston, to inhabitants of Phillipston, 20 years.

1876.

- May 8. South-west Pond, in Athol, to Adin H. Smith and others, 15 years.
- June 1. *Norwich Pond, in Huntington, to inhabitants of Huntington, 20 years.
10. Dug Pond, in Natick, to W. P. Bigelow and others, 15 years.
- Oct. 1. Farm and Learned's Pond, in Framingham, to inhabitants of Framingham, 15 years.
1. *Whitney's Pond, in Wrentham, to inhabitants of Wrentham, 15 years.
1. *Little Pond, in Falmouth, to George H. Davis, 15 years.

1877.

- March 1. *Nine-mile Pond, in Wilbraham, to inhabitants of Wilbraham, 15 years.
15. Pentucket and Rock Ponds, in Georgetown, to inhabitants of Georgetown, 15 years.
- Aug. 10. *Onota Lake, in Pittsfield, to William H. Murray and others, 15 years.
- Oct. 1. Fort, Great Spectacle, and Little Spectacle ponds, in Lancaster, to inhabitants of Lancaster, 20 years.
- Nov. 1. Tispaquin Pond, in Middleborough, to Abishai Miller, 15 years.

1878.

- Jan. 1. *Snituit, Long, Snow, and Mary's ponds, in Rochester, to inhabitants of Rochester, 15 years.
- Mar. 16. *Asnaconcomic Pond, in Hubbardston, to Amory Jewett, Jr., 15 years.
- April 1. Dorrity Pond, in Millbury, to inhabitants of Millbury, 10 years.
- May 1. *Bear Hill Pond and Hall Pond, in Harvard, to inhabitants of Harvard, 15 years.
5. Spectacle, Peters, and Triangle ponds, in Sandwich, to George L. Fessenden, 10 years.
- Oct. 1. *Eli Pond, in Melrose, to J. A. Barrett and others, 15 years.
1. Accord Pond, in Hingham, South Scituate, and Rockland, to inhabitants of these towns, 10 years.
1. Wright's and Ashley's ponds, in Holyoke, to Henry C. Ewing and others, 10 years.
1. *Magog Pond, in Acton and Middleton, to inhabitants of Acton, 15 years.

1879.

- Feb. 1. *Lake Mahkunac and Lake Overic, in Stockbridge, to inhabitants of Stockbridge, 10 years.
- July 1. Silver Lake, in Wilmington, to inhabitants of Wilmington, 10 years.
1. *Fresh Pond, in Falmouth, to Thomas H. Lawrence, 20 years.
- Oct. 1. *Pomp's Pond, in Andover, to inhabitants of Andover, 15 years.
- Nov. 1. *Lake Qu'napowitt, in Wakefield, to inhabitants of Wakefield, 14 years.

1880.

- March 1. Lake Winthrop, in Holliston, to inhabitants of Holliston, 15 years.
15. *Massapoag Pond, in Sharon, to inhabitants of Sharon, 10 years.

1880.

- May 1. *Tisbury Great Pond, in Tisbury, to Allen Look and others, 10 years.
- June 1. Indian Pond, in Kingston, to inhabitants of Kingston, 10 years.
1. *Jordan Pond, in Shrewsbury, to inhabitants of Shrewsbury, 15 years.
- July 1. *Swan and Martin's ponds, in North Reading, to inhabitants of North Reading, 15 years.
- Sept. 1. Herring Pond, in Eastham, to William H. Nickerson, 10 years.
- Dec. 24. Chadwick's Pond, in Bradford and Boxford, to town of Bradford, 10 years.

1881.

- Jan. 1. *Great and Job's Neck ponds, in Edgartown, to Amos Smith and others, 15 years.
- March 1. *The Mill Ponds (three), in Brewster, to Valentine B. Newcomb and another, 15 years.
- April 1. *Long Pond, in Blandford, to Samuel A. Bartholomew and another, 15 years.
- May 2. *Nonesuch Pond, in Weston and Natick, to W. A. Bullard and others, 15 years.

1882.

- March 1. *Blair's Pond, in Blandford, to Curtis M. Blair and another, 15 years.
- April 1. *Ward Pond, *alias* Wightman Pond, in Ashburnham, to Herbert F. Rockwood and another, 15 years.
- May 1. *Horn Pond, in Woburn, to inhabitants of Woburn, 15 years.
- June 1. *Wickaboag Pond, in West Brookfield, to inhabitants of West Brookfield, 15 years.

1883.

- March 1. *Halfway Pond, in Plymouth, taken by Commissioners for 5 years, in accordance with provisions of chap. 62, Acts of 1876.
- April 6. *Fresh Pond, in Tisbury, to Allen Look and others, 15 years.
23. *Keyes Pond, in Westford, to M. H. A. Evans, 15 years.
- May 7. Singletary Pond, in Sutton and Millbury, to towns of Sutton and Millbury, 15 years.
7. *The Great Pond, in Ashfield, to town of Ashfield, 15 years.
- July 1. Lake Buell, in Monterey and New Marlborough, to town of New Marlborough, 10 years.

1884.

- June 1. Bald Pate, Four-mile, and Stiles ponds, in Boxford, to inhabitants of Boxford, 10 years.
- July 15. *Asneybunskeit Pond, in Paxton, to inhabitants of Paxton, 10 years.
15. *Center Pond, in Dennis, to inhabitants of Becket, 10 years.
15. *Buckmaster Pond, in Dedham, to Francis Soule and others, ten years.
15. *Fresh Pond, in Dennis, to inhabitants of Dennis, 10 years.
17. *Farm Pond, in Cottage City, to John C. Hamblin and others, 15 years.
18. Mashpee, Great, and Wakeley ponds, in Mashpee, to inhabitants of Mashpee, 10 years.
- Aug. 30. *Sand Pond, in Ayer, to inhabitants of Ayer, 15 years.
- Sept. 5. *Great Pond, in North Andover, to inhabitants of North Andover, 15 years.

[C.]

AN ACRE OF WATER.

[*"American Field," Editorial.*]

An acre of water is not an expression naturally significant of a thing of great value, yet Seth Green, who is certainly an authority upon such matters, has declared an acre of water is worth more than an acre of the best land to a farmer, in productive power and valuable returns.

This being the case, it seems strange there should be such neglect of the water privileges so common in the greater part of the country. Thousands upon thousands of acres of water, in streams, ponds and small lakes, serve no better purpose than to water stock, or harbor a few miserable fish of the coarsest and poorest varieties, when with small outlay of capital and labor they could be made to pay largely.

The farmer's bill of fare is not so luxurious that fish are to be despised, yet the demands of work upon time are so great, it is only on rare occasions the boys can spare a few hours to go a-fishing. If then fish could be caught upon the place they could be made as available as the poultry in the barnyard, and would furnish an acceptable and wholesome change in the family diet; yet year after year the farmer sees the stream flow through his land, — a mimic river in the springtime when swollen by the melting snows, a mere sluggish rivulet under the summer sun, — with no thought that by a little labor when least pressed by other work he can make an artificial pond, which filled when the stream is at flood will hold water the year round, and properly stocked will be a constant source of food supply, saving him in the end far more than it cost.

A pond that is merely the abiding place of frogs, that is grown up all along its margin by rank weeds, is neither sightly nor valuable, and if drained would furnish tillable land that could be made profitable; but the same pond, cleaned out and stocked with fish suitable to such waters, becomes a very different thing, and thereafter assumes an importance in its returns which places it

at least on an equality with the same area of the best land on the farm.

Streams of sufficient size to afford valuable fishing privileges in their natural waters flow through such an extent of country that no single farmer or proprietor can control enough of them to make improvement or stocking a paying investment, but by combining their efforts, the owners of adjoining lands can accomplish all that can be desired, and at cost so small it will never be felt by the poorest individual.

When such improvement assumes the character of an important work, the legislatures can usually be found willing to afford those engaged in it all the protection in addition to their natural rights necessary to make that work a success, and to prevent the profits of it being diverted from those rightfully entitled to them. Thus owners have every inducement that sensible men can require to make the most of their water as well as their land, and if they fail to take advantage of it, they have no one but themselves to blame for the loss.

The day is fast coming when fishing privileges will be profitable as a matter of rent. The man who can control a good trout stream, or sufficient of it to afford good fishing, will never be at a loss for patrons, who will hire the exclusive right by the season, or pay liberally for occasional sport. It is not so long ago that in certain sections of the country every stream was filled with trout. By recklessness, greed and disregard for nature's laws they have been depopulated, but they are as capable to-day as ever in the past of sustaining their finny tribes, and if stocked and properly protected would prove gold mines to their owners.

It is not every man who can afford an expensive journey to the wilderness to fish, and those who cannot may be as enthusiastic lovers of the gentle art as their more fortunate neighbors. Such men would gladly avail themselves of the opportunity afforded by a neighboring stream for a few hours' or a day's recreation, and would consider the dollars which brought them health and pleasure well spent, while those dollars would be clear profit after a little time to the stream owner, for when his first investment was made good, all that would be necessary to keep the stream in stock would be to reasonably limit the catch, and protect the spawning season.

The black bass deservedly takes very high rank among the best of our game fishes, in the estimation of both the angler and the epicure. It is a native of the waters of many states, and has been introduced into those of others with the best results, nearly all our lakes, large and small, being well adapted to its needs.

Like other game fishes, however, it has suffered from the rapacity of fishermen, and waters which formerly afforded magnificent sport have in many instances become practically barren, and are very little fished except by those who are content with a basket in which coarse fish predominate over the good. In such the original condition of things can be restored by re-stocking.

The black bass grows rapidly and breeds largely, and with a few years' protection, until the young fry reach a size suitable for sport and food, lakes now worthless may become again the resort of anglers.

In private waters these fish may be made a source of profit that will repay well the cost of stocking. There will be no lack of fishermen able and willing to pay reasonably, if fish are fairly plentiful, and small lakes upon farms can be made to bring in larger returns than the same area of the best land. There is, too, always a ready market for the bass, and thus the owner of the water would have two sources of demand for his fish, and both good ones. No man, however, can expect to kill his goose and still get the golden eggs; and to insure paying permanently, the water must not be over-fished.

The fish commissioners of the different states will furnish freely information and advice as to the fish suitable for described waters, and will furnish fry for stocking those which are open to the public. For private waters, fry of suitable kinds can be obtained from any of a dozen hatcheries at very reasonable rates.

There is no reason then that men should continue to lose the profit from such a valuable portion of their possessions, or that townships or counties should not provide for the interests of their citizens, by making public waters furnish a supply of public food. The matter is certainly worthy of consideration by all sensible men and communities, and those who consider it reasonably cannot fail to be impressed with its advantages.

[D.]

COMMONWEALTH *vs.* WILLIAM A. BARBER.

SUFFOLK, ss.

DEVENS, J. The case at bar is that of a complaint under Pub. Stat., chap. 91, sect. 84, as amended by Stat. 1884, chap. 212, sect. 1. The section originally providing a penalty upon one for having in his possession, “with intent to sell either directly or indirectly,” a lobster of less than a prescribed size, was amended by striking out the words “with intent, etc.” As thus altered it would read as follows: “Sect. 84. Whoever sells or offers for sale, or has in possession, a lobster less than ten and one-half inches in length, measuring from one extreme of the body extended to the other, exclusive of claws or feelers, shall forfeit five dollars for every such lobster; and in all prosecutions under this section, the possession of any lobster not of the required length shall be *prima facie* evidence to convict.”

The contention of the defendant is that no prosecutions can be maintained upon propositions which can be read *uno flatu*, declaring that possession shall cause a penalty to be incurred, and that possession shall be *prima facie* evidence to convict; that these two propositions became law at the same instant of time, and that there is no resource except to declare the whole section, so far as it relates to the offence of possession, as unmeaning and incapable of enforcement.

It may be that it was deemed by the Legislature that this section might be construed as applying only to lobsters of the prohibited size taken within this State, and that it was intended the defendant should, by the *prima facie* evidence afforded by possession, be compelled to offer evidence that it was taken without the State, in order to maintain a defence. If, as the reason for the existence of the latter clause, as to the effect of possession, in connection with that by which the possessor is exposed to a pen-

alty, would be readily intelligible in view of the restricted character of the legislation as thus applicable only to lobsters taken within the Commonwealth and not elsewhere. Such a construction was in fact given to similar law, Stat. of 1879, chap. 209, sect. 1, enacted for the preservation of woodcock and other specified birds, and imposing a penalty for having one in possession during a certain prescribed period, the law being held to be intended only for the protection and preservation of birds bred within this Commonwealth. *Commonwealth vs. Hall*, 120 Mass. 410.

We do not, however, find it necessary to discuss this question, as if we assume in favor of defendant's contention, that the possession which is visited by the section with a penalty, is applicable whether the lobsters be taken within or without the Commonwealth; the section appears susceptible of an intelligible interpretation entirely in accordance with well-settled rules of construction. There are set forth in the earlier clause, three offences, "selling," "offering for sale," and "having possession." To the two first of these the latter clause is certainly applicable, and to the third it is not. The intent of the legislation is to make possession *prima facie* evidence of the offence, when the offence consists in something more than possession. Artificial force is often thus given by special provisions of statutes to particular facts when offered in evidence. *Commonwealth vs. Williams*, 1 Gray 1; *Holmes vs Hunt*, 122 Mass. 505. But where the whole offence consists in possession, the latter clause has no application to it, and the offence must be proved in the ordinary way. Although in terms the clause applies to all prosecutions under the section, "when the context shows that this cannot be followed literally without reaching an absurdity, it is reasonable to hold that such was not the intent of the legislation and that such an interpretation should be rejected." *Commonwealth vs Kimball*, 24 Pick. 366.

If possible, all parts of a statute should be viewed in connection with the whole, and made to harmonize so as to give a sensible effect to each. The different portions of a sentence or different sentences are to be referred respectively to the other portions or sentences to which we can see they respectively relate, even if strict grammatical construction should demand otherwise. The maxim of construction, *redunda singula singulis*, is well established, and if the latter clause be construed "respective et distributive," it will be found that it relates to the two first offences described in the section, and not to the third. *Coffin vs. Hussey* 12, Pick. 291; *Commonwealth vs. Jordan*, 18 Pick. 228.

Nor even if the latter clause must of necessity be applied to the offence of having in possession, should we be prepared to hold

that the statute was in this regard incapable of enforcement, and that there could be no prosecution for this offence. While the clause as applied to it would be superfluous and absurd, it would not be more than this. The government would still have upon it the burden of proving its case of possession beyond reasonable doubt, and the defendant could not claim that such proof if made was mere *prima facie* evidence.

Exceptions overruled.

[E.]

LEGISLATION.

[Chap 105.]

AN ACT TO PROTECT THE FISHERIES IN THE TRIBUTARIES OF
PLUM ISLAND BAY.*Be it enacted, etc., as follows :*

SECTION 1. No seine or net of any kind having a mesh of less than two and one-half inches shall be used in the waters of the tributaries of Plum island bay.

SECT. 2. The catching of smelts in the waters mentioned in section one between the fourteenth day of February and the first day of June is hereby prohibited, and whoever sells or offers or exposes for sale or has in his possession a smelt so taken in these waters within said season shall be subject to the same penalties as are provided in section fifty-seven of chapter ninety-one of the Public Statutes.

SECT. 3. Whoever violates the provisions of section one of this act shall be subject to a fine of not less than five dollars or more than twenty dollars for each offence.

SECT. 4. One-half of the penalty collected under this act shall be paid to the person or persons making the complaint and the remainder to the Commonwealth. [Approved March 24, 1887.

[Chap. 111.]

AN ACT TO REPEAL CHAPTER TWO HUNDRED AND EIGHTY-TWO
OF THE ACTS OF THE YEAR EIGHTEEN HUNDRED AND EIGHTY-
FOUR RELATING TO THE PROTECTION OF GAME IN THE PONDS
KNOWN AS COCKEAST OR DAVOL'S POND AND RICHMOND'S POND.*Be it enacted, etc., as follows :*

SECTION 1. Chapter two hundred and eighty-two of the acts of the year eighteen hundred and eighty-four, entitled " An Act for the protection of game in the ponds known as Cockeast or Davol's pond and Richmond's pond situated between the Westport River and the Rhode Island boundary line ", is hereby repealed.

SECT. 2. This act shall take effect upon its passage. [Approved March 24, 1887.

[Chap. 119.]

AN ACT TO PROTECT THE OYSTER FISHERY IN WESTPORT RIVERS.

Be it enacted, etc., as follows :

SECTION 1. Whoever takes any oysters from the natural oyster beds in Westport rivers, in the town of Westport, at any time previous to the first day of September in the year eighteen hundred and eighty-seven, shall forfeit five dollars for each bushel and fraction of a bushel so taken.

SECT. 2. The inhabitants of the town of Westport, at a legal meeting called for the purpose, may make regulations concerning the taking of oysters in said rivers after said first day of September; and whoever takes any oysters from said rivers contrary to such regulations shall be subject to the same penalties as are provided in the preceding section. The penalties provided in this act may be recovered by complaint or indictment in any court of competent jurisdiction.

SECT. 3. This act shall take effect upon its passage. [*Approved March 25, 1887.*]

AN ACT CONCERNING THE CATCHING OF FISH IN THE WATERS ADJACENT TO THE TOWNS OF BARNSTABLE, MASHPEE, YARMOUTH, DENNIS AND HARWICH.

Be it enacted, etc., as follows :

SECTION 1. Chapter one hundred and ninety-three of the acts of the year eighteen hundred and eighty-five, and chapter two hundred and two of the acts of the year eighteen hundred and eighty-six, and all acts and parts of acts prohibiting the use of seines and nets in the catching of fish in the waters adjacent to the towns of Barnstable, Mashpee, Yarmouth, Dennis and Harwich are hereby repealed.

SECT. 2. This act shall take effect upon its passage. [*Approved March 28, 1887.*]

[Chap. 193.]

AN ACT FOR THE PROTECTION OF THE FISHERIES IN THE WATERS OF THE TOWN OF WESTPORT.

Be it enacted, etc., as follows :

SECTION 1. Whoever draws, sets, stretches, or uses any net, purse or seine of any kind for taking fish in the waters of the town of Westport shall be punished by fine not exceeding one hundred dollars, or by imprisonment in the house of correction

not exceeding three months, or by both fine and imprisonment; all fish so taken shall be forfeited to the Commonwealth.

SECT. 2. All nets, purses and seines in actual use, set or stretched in violation of this act, are declared to be common nuisances.

SECT. 3. Nothing contained in this act shall apply to the taking of mackerel in any way in any of the said waters, nor to the taking by hand nets of smelts, herrings or alewives in any of said waters, nor to the taking of smelts, herrings, alewives or perch in that part of Westport River north of a line drawn east and west from the south end of Cadman's Neck in said river.

SECT. 4. The town of Westport shall at its next annual meeting choose by ballot three suitable persons in said town, one for the term of one year, one for the term of two years and one for the term of three years from said annual meeting, and, at every annual meeting thereafter, one for the term of three years; who shall be sworn to enforce the provisions of this act.

SECT. 5. All fines received under this act shall be paid one-half to the complainant and the other half to the Commonwealth.

SECT. 6. This act shall take effect upon its passage. [*Approved April 19, 1887.*]

[Chap. 197.]

AN ACT CONCERNING THE USE OF GILL NETS OR SET NETS WITHIN ONE HALF MILE OF THE SHORES OF THE TOWN OF MATTAPOISETT.

Be it enacted, etc., as follows:

SECTION 1. Section four of chapter one hundred and ninety-two of the acts of the year eighteen hundred and eighty-six is hereby amended by adding at the end thereof the following words, namely: — Or in the waters within one-half mile of the shores of the town of Mattapoisett, — so that the same as amended shall read as follows, namely: — *Section 4.* Nothing contained in this act shall be construed to interfere with the corporate rights of any fishing company located on said bay, nor to in any way affect the fish weirs mentioned in section seventy of chapter ninety-one of the Public Statutes, nor to the use of nets or seines in lawful fisheries for shad or alewives in influent streams of said bay, nor to the use of set nets or gill nets in the waters of the town of Fairhaven, within a line drawn from Commorant rock south-westerly to the buoy on West island rips, and from thence westerly in a straight course through the buoy on West island

ledge to the town line of Fairhaven, or in the waters within one-half mile of the shores of the town of Mattapoisett.

SECT. 2. This act shall take effect upon its passage. [*Approved April 20, 1887.*]

[Chap. 314.]

AN ACT FOR THE PROTECTION OF LOBSTERS.

Be it enacted, etc., as follows :

SECTION 1. Section one of chapter two hundred and twelve of the acts of the year eighteen hundred and eighty-four is amended by striking out the words “measuring from one extreme of the body extended to the other, exclusive of claws or feelers,” and by inserting in place thereof the words:—measuring from the extremity of the bone projecting from the head, to the end of the bone of the middle flipper of the tail of the lobster, extended on its back its natural length,—so that said section as amended shall read as follows:—*Section 1.* Section eighty-four of chapter ninety-one of the Public Statutes is amended so as to read as follows:—Whosoever sells or offers for sale or has in his possession a lobster less than ten and one-half inches in length, measuring from the extremity of the bone projecting from the head to the end of the bone of the middle flipper of the tail of the lobster, extended on its back its natural length, shall forfeit five dollars for every such lobster; and in all prosecutions under this section the possession of any lobster not of the required length shall be *prima facie* evidence to convict.

SECT. 2. One-half of the fines imposed under sections eighty-one, eighty-two and eighty-four, as amended, of chapter ninety-one of the Public Statutes and under this act shall be paid to the complainant and the other half to the county within which the offence was committed. [*Approved May 26, 1887.*]

[Chap. 300.]

AN ACT RELATING TO THE TRAPPING OR SNARING OF RUFFED GROUSE, HARES OR RABBITS.

Be it enacted, etc., as follows :

The provisions of section six of chapter two hundred and seventy-six of the acts of the year eighteen hundred and eighty-six, shall not apply to the trapping or snaring of ruffed grouse, commonly called partridge, hares or rabbits by an owner of land

upon his land, or by a member of the family of such owner if authorized by such owner, between the first day of October and the first day of January. [*Approved May 20, 1887.*

[Chap. 343.]

AN ACT TO REPEAL CHAPTER THIRTY-TWO OF THE ACTS OF THE YEAR EIGHTEEN HUNDRED AND SEVENTY-SIX RELATING TO THE EEL FISHERIES IN JONES RIVER IN THE TOWN OF KINGSTON.

Be it enacted, etc., as follows :

SECTION 1. Chapter thirty-two of the acts of the year eighteen hundred and seventy-six entitled "An act to preserve the eel fisheries in Jones river in the town of Kingston" is hereby repealed.

SECT. 2. This act shall take effect upon its passage. [*Approved June 1, 1887.*

[F.]

TABLES SHOWING

RETURNS OF WEIRS, SEINES AND GILL-NETS.

TABLE I.—POUNDS AND WEIRS.—*Showing the Catch of each during 1887.*

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Spanish Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fish.	Bels.	Other Edible Fish.
Manchester,	Jones Bros. & West,	•	66,650	37,500	•	•	•	•	30,257	•	•	•	•	•	5,600
"	John G. Heath,	•	5,750	300,200	•	6	1,755	•	26,754	3	12	41	336	•	•
Barnstable,	John Rogers,	•	30,502	•	18	•	68,780	34	88	•	107	2,980	1,157	•	•
Dennis,	Crowell Weir Co.,	•	•	•	•	•	•	•	46,075	4	30	28	•	•	•
"	A. T. Chase (East Fish Weir Co.),	•	3,600	•	92,015	•	•	•	•	•	•	2,050	2,000	•	•
"	Zenis H. Baker,	•	577	7,948	49	1	•	14	5	•	784	27	1	16	2,662
West Dennis,	Wm. Chalk & Co.,	•	32,132	•	•	29	•	•	•	•	585	28	6,411	40	71,595
Brewster,	Freeman Atwood & Son,	•	115	•	•	6	•	•	24,046	•	1,755	109	128	28	•
"	James Eldridge,	•	200	•	•	7	•	•	98,418	•	485	35	•	•	•
Truro,	Atkins, Huges and others,	•	120,300	228,950	•	•	•	•	297,857	4	1,989	2,600	48,074	•	•
"	Atkins, Huges and others (Great Swamp Weir Co.),	•	2	13,788	•	•	•	•	32,063	•	42	•	1,916	158	5,386
North Truro,	P. L. Paine & Co.,	•	19,650	111,173	•	•	21	1	57,846	•	207	461	13,907	•	248
Provincetown,	Henry J. Lewis,	•	•	31,500	•	8	•	•	15,026	•	•	16	4,150	•	•
Eastham,	P. Smith & Co.,	•	•	•	•	•	•	•	59,997	4	1,533	205	•	•	•
Orleans,	A. L. Walker,	•	85	1,155	•	•	•	•	42,055	3	1,548	514	30	•	136
Chatham,	Alpheus Mayo,	•	825	500	•	5	•	•	3,605	•	191	•	690	•	635

"	Stephen F. Bearse, . . .	1,168	13,335	157,700	-	-	-	-	39,144	-	-	-	-
"	Stephen W. Gould (Middle-town Weir Co.), . . .	650	12,400	288,100	3	1	58	6	29,572	-	3	182	725 11
"	Samuel S. Ellis, . . .	1,276	75,400	86,700	1	-	8	3	19,535	-	-	28	258 - 1,900
Plymouth,	J. C. & E. Barnes, . . .	-	44,220	-	-	-	-	-	-	-	-	-	-
Chatham,	Andrew Harding & Co., .	1,773	7,850	78,100	7	-	143	-	-	-	4	33	515 1
"	Benj. Malloves (Gull Point Weir Co.), . . .	1,587	77,600	24,100	-	-	1,652	65	51,404	-	8,737	1,325	4,012 -
"	Wm. R. Bloomer & Co., .	982	17,448	147,425	30,498	4	7	1	189,445	-	74	9	475 -
Harwich,	D. F. Weeks & S. E. Bearse, .	652	40,865	-	23	7	-	1	5	-	53	192	12,479 -
South Harwich,	Cyrus Nickerson, . . .	163	3,611	52,000	-	-	30,887	-	735	-	1,152	20	336 -
Hyannisport,	T. F. Phinney, . . .	176	3,245	1,660	69	25	3,989	13	16	-	4,264	13	249 -
Falmouth,	Isaiah Spindel, . . .	84	30,385	188	291	4	87,149	608	101	-	1,827	3,228	1,524 -
"	Peter Wainright, . . .	15	-	12,990	-	16	11,303	31	-	-	60	184	496 17
"	Prince M. Stuart, . . .	38	27,700	-	214	1	15,317	94	197	9	478	2,178	2,073 -
Mattapoisett,	Lilburne Hiller, . . .	-	533	1	8	-	8,136	211	1	-	59	103	529 19
"	Alexander B. Bowman, . .	2	11,027	-	-	10	2,098	85	-	-	2	289	2,019 22
"	Joseph Nye, . . .	-	-	-	-	-	973	-	-	-	-	101	26 -
"	J. B. Dunn, . . .	-	43,729	-	-	-	11,572	57	-	-	13	711	1,533 108
Goswold,	Chas. C. Church, . . .	39	1,945	244	6	7	187,176	846	963	26	1,992	285	2,357 1
"	H. J. Allen & David Bosworth,	-	520	-	3	1	193,711	4	116	-	8	288	303 -
"	Manchester & Allen, . . .	12	1,600	-	-	2	32,092	2	-	-	-	496	- 9,888

TABLE I. — POUNDS AND WEIRS — Concluded.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alwives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Spanish Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fish.	Beils.	Other Edible Fish.
Goswold,	Peter B. Davis,	.	-	-	-	-	55,150	-	-	-	-	-	-	-	2,940
"	Alonzo B. Veeder & Co.,	.	187,035	-	-	-	159,680	989	-	-	2,165	786	5,248	-	15,383
"	Chas. C. Allen,	.	3,382	-	-	-	162,705	27	929	-	10	3,097	4,524	-	11,069
"	Akin & Manley,	.	369	-	-	-	229,066	6	916	-	20	136	590	-	101,765
"	Frederick A. Veeder & Co.,	.	4,655	300	-	-	239,025	-	409	-	-	130	356	-	91,430
Fairhaven,	R. W. Pease,	.	30,829	-	55	89	73,729	113	-	-	209	8,089	12,886	3,510	40,414
"	Daniel W. Deane,	.	48,001	3,877	218	87	67,931	350	42	1	3,587	13,811	12,489	2,680	67,892
"	Saml. P. Dunn & Son,	.	21,730	-	90	27	38,202	204	1	-	789	5,819	1,846	329	48,300
"	John C. Allen,	.	6,348	-	-	23	4,095	51	-	-	-	2,298	372	55	16,336
"	George R. Wixon & Co.,	.	6,053	-	-	10	7,141	36	-	-	1	543	244	147	31
"	Geo. L. Hiller & Walter Gamons,	.	34,447	-	-	25	139,180	442	405	-	341	12,424	7,044	126	38,766
"	C. H. Pease & Co.,	.	57,195	-	-	52	124,512	306	8	-	801	12,512	9,922	-	75,416
"	Ebenezer Mott,	.	5,645	-	-	-	3,752	60	6	-	7	1,343	871	41	1,781
Westport,	James M. Soule,	.	4,430	-	-	-	-	-	-	-	-	-	-	-	-
So. Dartmouth,	Andrew Backus & Shell,	.	42,576	-	-	432	5,634	2,414	62	4	1,037	1,070	2,093	-	-
"	Nicolas Priaux,	.	250	116,062	881	-	26,390	605	31	3	253	176	2,626	43	21,271
Dartmouth,	Benj. Queripel,	.	13,605	-	-	52	17,203	220	-	4	5	1,067	2,488	62	39,680

"	Waite & Smith,	503	75,877	7,520	490	728	28,127	4,067	-	17	2,020	2,675	113,651	-	5,719
"	Joseph F. Briggs,	90	45,399	111	591	326	2,513	385	-	-	859	1,302	3,269	163	423
"	Geo. Prialx,	81	8,239	257	674	13	47,708	1,037	73	5	359	1,002	5,364	23	39,015
"	Geo. A. Snell,	138	49,836	591	737	25	75,728	846	192	19	719	1,517	4,890	1	24,376
Chilmark,	H. O. Poole & Co.,	35	23,075	500	3	-	11,036	270	1,072	3	127	84	3,695	-	14,740
"	R. Flanders & Co.,	44	6,049	6,225	975	3	1,302	575	110	-	322	-	742	-	60
Wood's Holl,	Lewis Edwards,	84	1,979	1,981	29	221	8,192	625	47	-	214	442	-	14	4,980
Nantucket,	W. I. Fisher,	-	-	-	-	-	-	-	-	-	2,356	-	653	-	-
Viney'd Haven,	C. F. Cleveland,	2	7,097	500	4	-	770	-	-	1	1	13	-	-	1,075
	Total,	14,044	1,453,820	1,713,846	127,951	1,233	2,133,504	15,742	1,069,609	109	44,204	89,075	304,492	7,615	\$12,810

TABLE II. — SALT-WATER SEINE. — Showing the Catch of each during 1887.

TOWN or PLACE.	PROPRIETOR.	Shad.	Alewives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Spanish Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fish.	Eels.	Other Edible Fish.
Newburyport, . . .	C. A. Caswell, . . .	-	255,600	739,200	-	-	-	-	-	-	-	-	-	29,800	-
Barnstable, . . .	B. F. Lumbert, . . .	1	-	-	-	441	-	-	-	-	7,773	-	-	-	10
Yarmouth, . . .	P. P. Aken, . . .	-	49,086	-	-	-	-	-	-	-	-	-	-	-	-
South Yarmouth, . . .	D. S. Baker, . . .	8	4,180	-	-	13	-	-	-	-	72	-	-	-	-
Chatham, . . .	Alvin Z. Atkins, . . .	-	-	-	-	115	-	-	-	-	235	-	-	-	-
Westport, . . .	Samuel G. Allen, . . .	-	1,254	-	-	1	-	-	-	-	-	-	-	14	117
" . . .	Perry G. Potter, . . .	-	2,612	-	-	-	-	-	-	-	-	-	-	-	462
South Westport, . . .	Charles F. Hitt, . . .	-	1,708	-	-	-	-	-	-	-	-	-	11	529	1,618
" . . .	Charles A. Tripp, . . .	-	619	-	-	-	-	-	-	-	-	-	-	7	77
Westport, . . .	E. Elbridge Atwood, . . .	-	3,825	-	-	-	-	-	-	-	-	-	-	-	269
" . . .	Joseph T. Lawton, . . .	-	4,505	-	-	-	-	-	-	-	-	-	-	65	450
" . . .	Lysander W. White, . . .	-	1,576	-	-	-	-	-	-	-	-	-	-	-	8
Totals, . . .		9	324,965	739,200	-	570	-	-	-	-	8,080	-	11	30,415	3,011

TABLE III. — GILL-NETS. — Showing the Catch of each during 1887.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Spanish Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fish.	Eels.	Other Edible Fish.
Bay View, Gloucester,	Alex Sargent & Bro.,	465	7,468	3,675					13,615	1					
Barnstable,	Moses Sturges, Jr.,					17	242	5			2,672	6	1		
"	James D. Kelley,						125				125				187
"	Manuel S. Brown,								8,980						
Centreville,	C. E. Bearse,										782				
Provincetown,	Levi B. Kelley,			212					1,451	1	8				
"	J. C. P. Hawender,		5,175	12,051					11,756		8				
"	Joseph Sears,		5,853	2,312					3,492		5		48		
"	Thomas Mayo,			605					115						580
"	Chas. Williams,			13,350				2,500	10,757						
"	Reuben Ryder,								1,163				12,100		
"	Paul L. Bangs,								4,174				1,869		
"	Herman L. Mayo,			6,695					20,284		604				
"	Frank Sears,								32,175						
"	James G. Rand,								34,995						
"	Joseph E. Weeks,								2,040		28				

TABLE III. — GILL-NETS. — Showing the Catch of each during 1887 — Concluded.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alwives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Spanish Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fish.	Eels.	Other Edible Fish.
Eastham, .	John Fulcher, .	324	3,360	1,000	2	2	-	-	32,404	-	2,526	423	161	-	7
Chatham, .	John S. Ryder, .	2	288	111	7	11	3	-	-	-	-	14	5	-	312
Mattapoisett, .	Lilburne Hiller, .	1	-	-	48	1	254	58	-	-	1,470	13	11	1	299
Fairhaven, .	Daniel W. Deane, .	-	-	-	-	-	52	23	-	1	156	1	-	-	312
Nantucket, .	W. F. Ramsdell, .	-	-	-	-	-	-	-	-	-	2,423	-	-	-	-
"	Collins, Small & Co., .	-	-	-	-	-	-	-	-	-	2,814	-	-	-	-
"	Ebbert M. Dunham, .	-	-	-	-	-	-	-	-	-	322	-	-	-	-
Totals,		792	22,144	40,011	57	31	676	2,586	177,401	3	13,938	457	14,195	1	1,697

TABLE IV.—CONNECTICUT RIVER SEINES.—1887.

TOWN OR PLACE.	PROPRIETOR.	Shad.
South Hadley,	C. C. Smith and others,	850
	Total,	850

TABLE V.—MERRIMAC RIVER SEINES.—1887.

TOWN OR PLACE.	PROPRIETOR.	Shad.
North Andover,	Eben Sutton,	28
	Total,	28

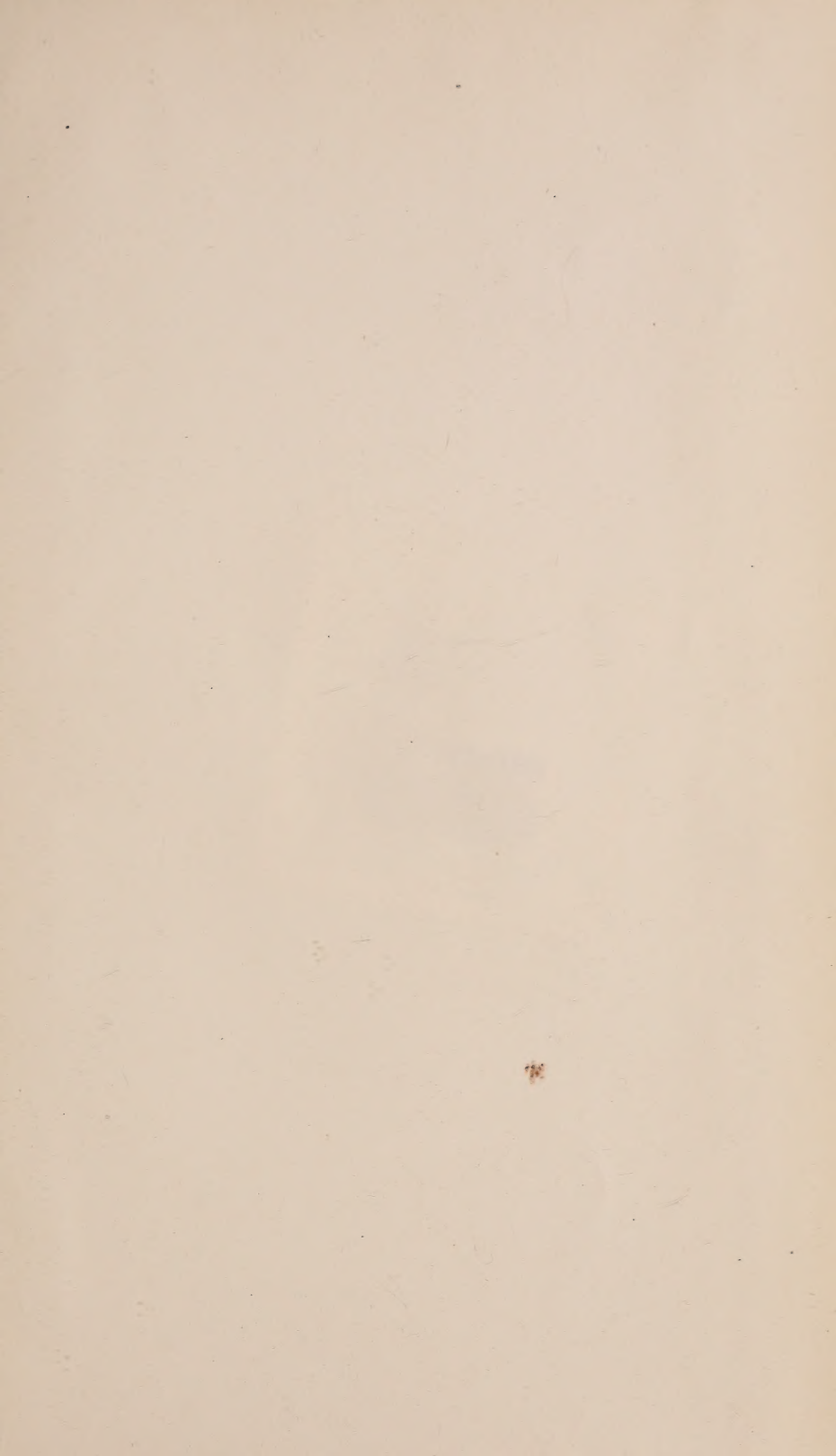
TABLE VI.—TAUNTON RIVER SEINES.—1887.

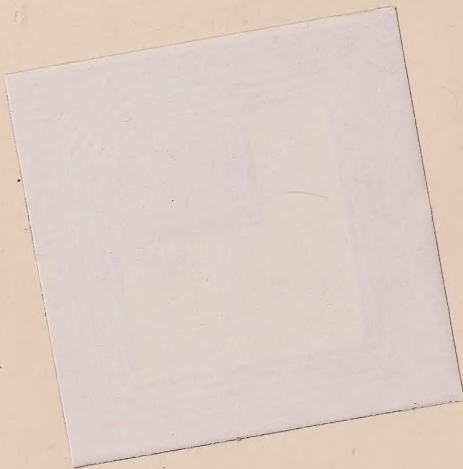
TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.
Raynham,	Gustavus King,	815	73,885
"	Geo. B. & E. Williams,	1,204	98,502
Taunton,	John W. Hart & Co.,	302	63,100
Dighton,	Chas. W. Simmons,	800	150,000
Berkley,	Isaac N. Babbitt,	425	109,545
"	Wm. H. Walker,	300	150,000
"	Nichols & Shore,	700	208,000
Somerset,	John Simmons,	4	10,246
	Total,	4,550	863,278

TABLE VII.—OTHER FRESH-WATER SEINES AND DIP-NET FISHERIES.—1887.

TOWN OR PLACE.	PROPRIETOR.	Alewives.	Eels.
West Medford,	Cross Bros.,	61,568	—
Hingham,	Thomas Weston,	1,825	11,525
West Brewster,	J. Howard Winslow,	94,331	—
Mattapoisett,	A. H. Shurtleff,	280,635	—
Chilmark,	Estate of H. M. Smith,	16,050	—
	Total,	454,409	11,525

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